INDEX NUMBER

Archives of

PHYSICAL MEDICINE AND REHABILITATION

(Formerly Archives of Physical Medicine)

Official Journal
American Congress of Physical Medicine and Rehabilitation
American Society of Physical Medicine and Rehabilitation

VOLUME XXXIV DECEMBER, 1953 NO. 12

ANNUAL SESSION • WASHINGTON, D.C. • SEPTEMBER 6-11, 1954

American Congress of Physical Medicine and Rehabilitation

32nd Annual

Scientific and Clinical Session

and

Instruction Seminar

SEPTEMBER 6-11, 1954

Official Headquarters

HOTEL STATLER
Washington, D.C.

EXECUTIVE OFFICES
30 NORTH MICHIGAN AVENUE CHICAGO 2, ILLINOIS

ULTRASONIC THERAPY

At the 31st Annual Scientific and Clinical Session of the American Congress of Physical Medicine further progress was reported in evaluating ultrasonic therapy. Among other things there appeared to be rather general agreement that it may be the treatment of choice in certain cases of bursitis and osteo-arthritis.

Renewed emphasis was placed on the importance of controlling dosage and possible danger from over-dosage. As with any new modality the physician should thoroughly familiarize himself with its contraindications and with the correct technic for treating those cases where ultrasonic therapy may be indicated.

Burdick has been engaged in a developmental program of ultrasonic apparatus for several years. The Burdick model, which will soon be on display in the show rooms of our authorized dealers, will incorporate the features found to be essential and desirable by those who have pioneered the use of ultrasonics in medicine.

In the meantime fill out and send us the coupon below and let us tell you about this new development.

Burdick

THE BURDICK CORPORATION • MILTON, WISCONSIN

Please send, without obligation, information on the Burdick ultrasonic unit as soon as it is available.

NAME_____

ADDRESS_____

_____

OUR 37th YEAR

WOODWARD ••

Medical Personnel Bureau

FORMERLY ATKOE'S

3rd floor • 185 N. WABASH • CHICAGO 1

• • • ANN WOODWARD, DIRECTOR

OPPORTUNITIES AVAILABLE

PHYSICAL THERAPISTS: (a) Chief; to head rapidly growing dept.; staff of 4 handle 30 pts a day, 1/2 are out pt., treatment largely, polio, strokes, fractures, arthritis; increase prog. with new bldg process; all modern equipt., whirlpools, Hubbard tank, diathermy, bakers, lamps, exercise • units, 2 med spr. seminars, institutes etc in relation to specialty, $4200 to $4800 dep., on exp; NW. (b) 318 bed hosp. seeks Reg ther; good position with opportunities to advance, training sch. for nurses, college twn, NW. (c) Hosp and Clinic combined need reg ther, will take one not reg with good exp; excellent working condition, co-operates staff; Edge of famous Nat'l park, resort summer trade, sportsmen in winter; (d) Chief to head busy dept; for 300 bed gen'l hosp, excellent facilities; twn 50,000 near Wash. D.C. (e) Female pref. will consider male, for large Med School aff'l hosp opportunity to do P.G. work, must be reg. Chgo.

WANTED

Registered physical therapist experienced in the care of polio patients; salary $325.00 or more per month depending on experience and recommendation; eight hour day, five day week with pleasant working conditions. Write Sister Mary Ellen, Administrator, Leila Y. Post Montgomery Hospital, Battle Creek, Michigan.

OPPORTUNITIES AVAILABLE

(Please send for our Analysis Form so we may prepare an Individual Survey for you.)

WANTED—(a) Physiatrist; head department, new hospital, 325 beds; large city, university center, Midwest. For further information, please write Burneice Larson, Director, Medical Bureau, Palmolive Building, Chicago.

WANTED—(a) Chief therapist; new rehabilitation center; modern facilities; university city, Midwest. (b) Chief, orthopedic school; well established program; patients include post polios and palsy children; resort town near university city, South. (c) Occupational therapist; direct department, small hospital specializing in neurology; university medical center, Midwest. (d) Chief physical therapist; new department, 22-man group; college and resort town, West. (e) Graduate nurse qualified in physical therapy; office of two Board specialists; winter resort town, Southwest. (f) Physical therapist; department operated by 15-man group; California. (g) Occupational therapist and physical therapist, to head departments new hospital; resort city, West. (h) Physical therapist; university medical school; program of treatment, research, education; opportunity continuing studies; East. (i) Physical therapist; hospital operated by American industrial company in Central America. For further information, regarding these opportunities, please write Burneice Larson, Medical Bureau, Palmolive Building, Chicago.

Immediate opening for qualified physical therapist handling cases for rehabilitation of industrial handicapped. Starting salary $3600 and up, depending on experience. Five day week, accident and health benefits, paid vacations and other benefits. Unusually congenial young staff working under medical directorship. Write Geo. P. Sawyer, Mgr., Rehabilitation Center, Liberty Mutual Insurance Co., 9 So. Wacker Drive, Chicago, Ill.

WANTED

REGISTERED PHYSICAL THERAPISTS for staff of 286-bed modern general hospital located New England college community. New department of Physical Medicine and Rehabilitation. Wide variety of cases. Liberal personnel policies. Good starting salary. Semi-annual reviews. Living quarters optional. Laundry furnished. For complete details write: Mr. George Stoddard, Personnel Director, Mary Hitchcock Memorial Hospital, Hanover, N. H.

—WANTED—

Qualified physical therapist for general hospital with large orthopedic service. Apply to Audrey Shade, Administrator, St. Luke's Hospital, Marquette, Michigan.

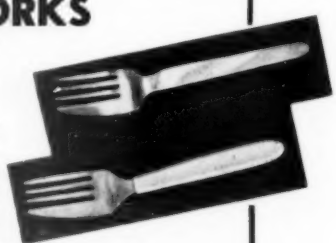
—AVAILABLE—

Position available in expanding department of 175 bed general hospital. Hospital fully approved, located in city of 35,000 in central Kansas. For complete information and details, write Administrator, Grace Hospital, Hutchinson, Kansas.

KNIFORKS

Eating pleasure for the Handicapped

Patient can safely cut and eat any food with 1 hand. SPECIAL KNIFORK with NEW handle permits eating even without normal use of hand. Scientifically made of stainless steel and heat resistant plastic, boilable.



Knifork $2 each, 6 for $10.
Special Knifork $2.95 each, 6 for $15.75. Specify right or left hand. Guaranteed. Order from—

MOORE ENGINEERING CO.

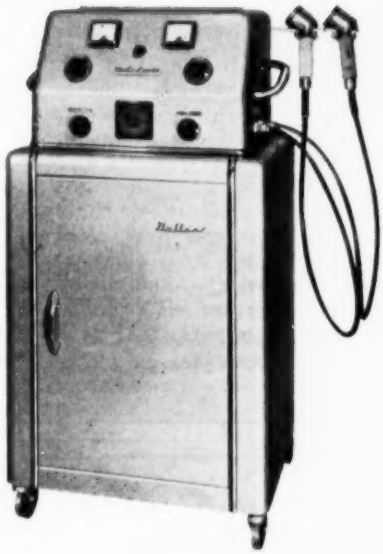
P. O. Box 19065 LOS ANGELES 43

THERE'S A VAST DIFFERENCE IN ULTRASONIC EQUIPMENT!

Just another reason why doctors are turning to the new

Dallons MEDI-SONAR

The biological effectiveness of ultrasonic therapy is only as precise as the instrument used. The MEDI-SONAR, with its exceptional precision and fidelity, possesses many exclusive qualities.



The MEDI-SONAR, including each quartz crystal transducer, is made *entirely* in the United States, by Dallons Laboratories. Each component is accurately factory-matched and perfectly balanced for maximum efficiency. Being completely "*Made-In-America*" as a unified product of one manufacturer, it is free from "*overseas-service*" *problems* and is fully guaranteed by Dallons—a foremost producer of quartz-crystals for radar and other important government uses for over 12 years and a famous name in electro medical-surgical equipment for a quarter of a century.

Users of ultrasonic equipment will avoid many "service" headaches if they insist on the American-Made Dallons MEDI-SONAR.

Write for Illustrated Professional Literature.

Dallons Laboratories, Inc.

5066 SANTA MONICA BLVD. LOS ANGELES 29, CALIF.

OLympia 1951

CHANGING YOUR ADDRESS?

Send your new address at least 30 days before the month of the issue with which it is to take effect.

Address
ARCHIVES OF PHYSICAL MEDICINE
AND REHABILITATION
30 N. Michigan Ave., Chicago 2.

Send old address with the new, enclosing if possible, your address label. The Post Office will not forward copies of the journal unless you provide extra postage. Duplicate copies cannot be sent.

M/Sgt. Hubert L. Lee
USA

Lt. Col. R. R. Myers
USMC

Major Carl L. Sitter
USMC

M/Sgt. Harold E. Wilson
USMCR

Pfc. H. A. Capperata, Jr.
USMCR

T/Sgt. R. S. Kennemore
USMC

Sgt. J. C. Rodriguez
USA

Lt. Thomas Hudner, Jr.
USN

Capt. Lewis L. Millett
USA

Capt. Raymond Harvey
USA

In all, 104 men have won the Medal of Honor in Korea. The men here stand as representatives of them—and of all the service men and women to whose devotion we in America owe our security this Christmas of 1953.

Peace...

their Christmas Wish for us!

THESE are some of the bravest men on earth.

Yet these young holders of the Medal of Honor were never fighters for the love of fighting. They are men of war with a dream of peace.

They want a world in which small wide eyes can gaze in rapture at a tinselled tree. Where a happy Christmas is a child's inalienable right—because fear and force have at last given way to peace and law and goodwill.

They have fought ably for peace, with courage "above and beyond the call of duty." Can we, at home, do something for it, too?

Yes. Beginning now, each of us who earns can put some part of his earnings into United States Defense Bonds. For by these Bonds we make our own families secure, first of all. Then, out of the security of our families, we build the strength of America—to *stay* at peace in a world where peace still is only for the strong.

★ ★ ★

You can invest in Defense Bonds *best* through the Payroll Savings Plan where you work or the Bond-A-Month Plan where you bank. Won't you begin—today?

REGIONAL OFFICERS

AMERICAN CONGRESS OF PHYSICAL MEDICINE AND REHABILITATION

EASTERN SECTION—Chairman, Hans J. Behrend, New York, N. Y.; Secretary, Herman L. Rudolph, 400 N. Fifth St., Reading, Pa.

States represented: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island and Vermont.

MIDWESTERN SECTION — Chairman, William D. Paul, Iowa City, Iowa; Secretary, Miland E. Knapp, 920 S. 7th St., Minneapolis 4, Minn.

States represented: Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota and South Dakota.

WESTERN SECTION—Chairman, John H. Aldes, Los Angeles, Calif.; Secretary, Leonard J. Yamshon, 224 N. Serrano Ave., Los Angeles 4, Calif.

States represented: California and Nevada.

NORTHWESTERN SECTION—Chairman, Sherburne W. Heath, Jr., Seattle, Wash.; Secretary, Everill W. Fowlks, 431 Vista Rd., Oswego 3, Ore.

States represented: Idaho, Montana, Oregon and Washington.

ROCKY MOUNTAIN SECTION—Chairman, Harold Dinken, Denver, Colo.; Secretary, Jerome W. Gersten, Univ. of Colorado Medical Center, 4200 E. Ninth Ave., Denver 7, Colo.

States represented: Arizona, Colorado, New Mexico, Utah and Wyoming.

CENTRAL SECTION — Chairman, Ralph E. Worden, Columbus, Ohio; Secretary, Frederic B. House, 1942 Steere Pl., Ann Arbor, Mich.

States represented: Illinois, Indiana, Kentucky, Michigan, Ohio, West Virginia and Wisconsin.

SOUTHERN SECTION — Chairman, Lt. Col. John H. Kuitert, Ft. Sam Houston, Texas; Secretary, Edward M. Krusen, Jr., 3500 Colgate, Dallas 5, Texas.

States represented: Arkansas, Louisiana, Mississippi, Oklahoma and Texas.

SOUTHEASTERN SECTION—Chairman, Herbert W. Park, Richmond, Va.; Secretary, Duane A. Schram, Box 274, Neptune Beach, Fla.

States represented: Alabama, Florida, Georgia, North Carolina, South Carolina, Tennessee and Virginia (District of Columbia).

The officers of the American Congress of Physical Medicine and Rehabilitation and the Editorial Board of the ARCHIVES extend to all members, readers, advertisers and friends, their very best wishes for a Merry Christmas and a Happy New Year.

American Society of Physical Medicine and Rehabilitation Officers and Committees for 1954

President — Donald L. Rose
President-Elect — Harold Dinken
Vice-President — Ben L. Boynton
Secretary-Treasurer — Max K. Newman

Board of Governors

Walter S. McClellan
Max K. Newman
Ben L. Boynton
Nila Kirkpatrick Covalt
William D. Paul
George D. Wilson
Herman L. Rudolph

Membership Committee

Solomon Winokur, Chairman
Fritz Friedland
Robert W. Boyle

Nominating Committee

Louis B. Newman, Chairman
Ray Piaskoski
Arthur C. Jones

Program Committee

Murray B. Ferderber, Chairman
Robert L. Bennett
Sedgwick Mead

Contents—Dec. 1953

Volume XXXIV No. 12

ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION

(Formerly Archives of Physical Medicine)

30 North Michigan Avenue, Chicago 2, Illinois

Published monthly at Chicago, Illinois, by the American Congress of Physical Medicine and Rehabilitation.
Entered as Second Class Matter at the Post Office at Chicago, Illinois.

ORIGINAL ARTICLES

•

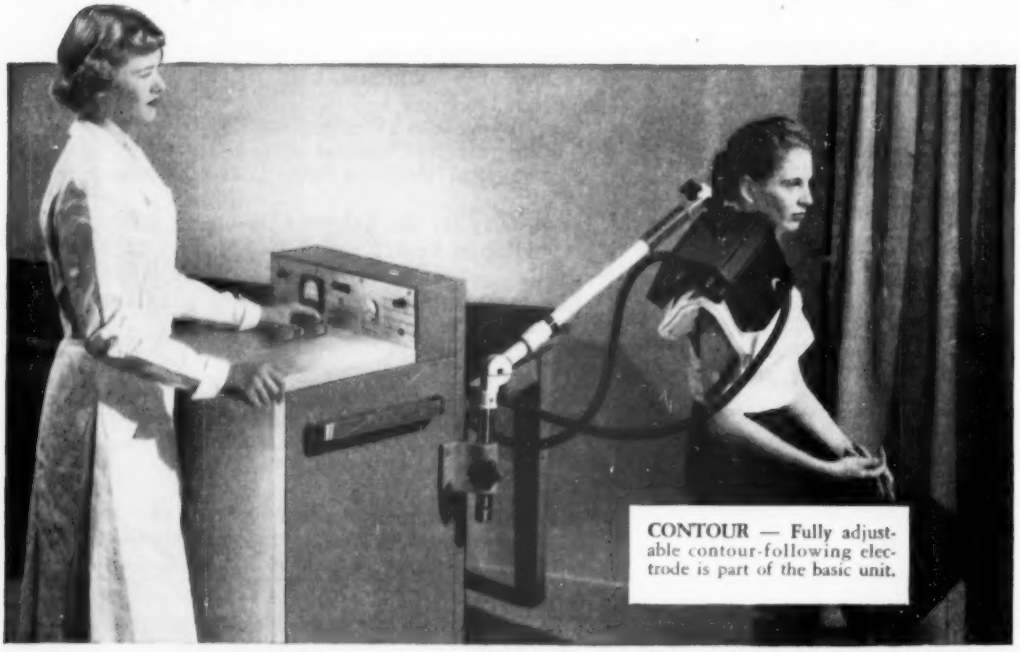
Editor of the Month

WALTER M. SOLOMON, M.D.

Cleveland, Ohio

Printed in U.S.A.

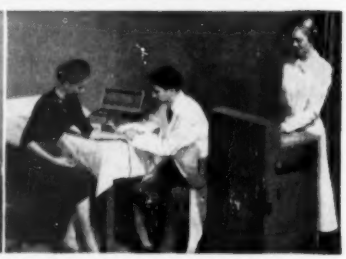
13.56-megacycle diathermy gives you truly efficient induction heating



CONTOUR — Fully adjustable contour-following electrode is part of the basic unit.

CABLE—Optional is 12-ft cable. Note how electrodes attach in rear.

AIR SPACE—Also available: adjustable air-spaced condenser electrode.



ELECTROSURGICAL facilities are an integral part of the unit.

And GE's Model F Inductotherm provides it . . . with 200 watts output

It's vascular heat — not surface heat — that produces results in diathermy. That's why the Model F Inductotherm operates at 13.56 megacycles — a frequency proven by test to give high efficiency in the heating of vascular tissue.

Output of 200 watts is more than ample for all modern technics. You get a built-in reserve that insures long component and unit life utilizing any of the four facilities illustrated above.

Get all the facts on the Model F. You'll find it offers many outstanding advantages in convenience, safety, speed and economy. See your GE x-ray representative or write X-Ray Department, General Electric Company, Milwaukee 1, Wisconsin for Pub. O-12.

GENERAL ELECTRIC

The Third John Stanley Coulter Memorial Lecture

A MEDICAL PHYSICIST LOOKS AT PHYSICAL MEDICINE

OTTO GLASSER, Ph.D.
CLEVELAND

I deeply appreciate the honor of being invited to deliver the Third John Stanley Coulter Memorial Lecture. I do so with a great deal of pride and at the same time with humility. Proud, to have known for many years a great man like Dr. Coulter, and humble when attempting to evaluate his accomplishments for Physical Medicine in particular and for humanity in general. Although I am not a physiatrist, I had the good fortune to see and talk with Dr. Coulter several times each year for more than twenty years. Each time I saw him, it seemed to me, he had made another successful step toward the goal of full recognition of physical medicine as a valuable and important branch of medicine. Perhaps a short report of my own contacts with physical medicine during a period of nearly forty years may illustrate its successful developments and show at the same time how I happened to meet and learn to admire Dr. Coulter and so many of his colleagues.

My first contact with physical therapy was in the Zander Institute of Dr. Vulpius' Orthopedic Clinic at the University of Heidelberg in 1915. I had been wounded early in World War I and met here for the first time a number of machines for exercise and manipulation of various parts of the body as well as some simple electrical apparatus for testing of nerves and stimulation of muscle action. Most physical therapy institutions in Europe were at that time attached to the orthopedic departments and were called Zander Institutes after the Stockholm physician Jonas Gustav Wilhelm Zander, born in 1835, who had developed some of the early exercise equipment.

My first teaching of some of the physical foundations of physical therapy was done in this country in 1923 and was not an unmitigated success. Dr. C. M. Sampson, who had been with the physical therapy service of Walter Reed Hospital and other army and veterans' hospitals during World War I, travelled around the country and gave condensed courses in physical therapy technic. While in Cleveland, he invited me to talk to his class for two hours on physics. I had been in this country for only one year and my English was poor. I overestimated the fundamental knowledge in physics of my audience and spoke over their heads. But above all, it was September 14, 1923, the night of the Dempsey-Firpo fight. It was a hot night and all ears of my class were cocked toward the open windows to hear the newspaper boys shout the result of the fight, radios still being in their infancy. Since Dempsey knocked out Firpo in the second round, these voices soon were heard and you may well imagine what happened to my audience! My first teaching effort in physical therapy was a complete failure. Nevertheless, Dr. Sampson asked for a rising vote of thanks which, much to my surprise, was cheerfully given.

My next contacts with physical medicine were made at the first five International Congresses of Radiology, in London, 1925; Stockholm, 1928; Paris, 1931; Zurich, 1934, and Chicago, 1937. I remember meeting and talking with Dr. Cumberbatch from London, Doctors Paetzold and Schliephake of short wave

Read at the Thirty-first Annual Session of the American Congress of Physical Medicine and Rehabilitation, Chicago, September 2, 1953.

Professor of Biophysics, Frank E. Bunts Educational Institute; Head, Department of Biophysics, Cleveland Clinic Foundation, Cleveland.

diathermy fame; Dr. Sonne of the Finsen Institute, Dr. Rollier of Leysin, Doctors Belot and Delherm, Saidman and many of this group, namely, Doctors Krusen, Bierman and Coulter. These first Congresses of Radiology had divisions on electrotherapy and helio- or actinotherapy. These were the international forums where physicians in charge of physical therapy departments presented their papers. These sections were dropped at the Sixth International Congress of Radiology which took place in London in 1950. Last year you had your own splendid first International Congress of Physical Medicine as a separate entity in London. That international landmark was a tremendous step forward in the organization of your special branch of medicine.

My first publishing effort in the field of physical medicine was the incorporation of a section on physical medicine in our book, *Medical Physics,* a cooperative effort of several hundred scientists. The first volume was published in 1944, and the second was published in 1950. Dr. Walter J. Zeiter with his effervescent enthusiasm was the associate editor of the section on Physical Therapy and the names and contributions of contributors attest to his organizational ability. To name but a few, we have again Doctors Coulter, Pemberton, Bierman, Elkins, Kovács, Krusen, Solomon, Hansson, McClellan, W. H. Schmidt and twenty-six more contributing physiatrists.

Ten years of teaching medical physics to our students in physical therapy at the Frank E. Bunts Educational Institute followed and have almost erased from memory my unfortunate start in that activity.

In 1951, it was my pleasure to be elected a member of the Council on Physical Medicine and Rehabilitation of the American Medical Association and this office has brought me into still closer contact with your interesting specialty.

This kinship with physical medicine has given me a great deal of stimulation and joy. I value highly the friendship of so many among you.

The question, "What does a biophysicist see when he looks at physical medicine?", can be answered only in a rambling and rather disconnected series of thoughts.

Isotopes

The use of isotopes in physical medicine is still limited to a few diagnostic procedures. Sodium (Na^{24}) is used in the study of some peripheral vascular diseases. Dr. Harry Zankel at the Crile Veterans Hospital in Cleveland, has done interesting work with radioactive tracers in studying the effect of various physical modalities upon saphenous circulation time. Doctors Alfred Ebel and Lawrence Wisham of the Bronx Veterans Administration program used the clearance rate of sodium (Na^{24}) from a massaged muscle and studied muscle temperature at the same time. It was found that the blood flow to the muscle was not increased as a result of the massage but that the circulation in the skin was increased. Circulation in newly transplanted tissue is observed by means of radioactive tracers to find out how well the transplant has taken. A report on experimental iontophoresis studies with radioisotopes was recently made. More and more of such studies with radioactive tracers are being undertaken.

Ultrasound Waves

A great deal has been written recently about the therapeutic use of ultrasound waves of frequencies in the neighborhood of 800 to 1000 kilocycles per second. The early enthusiasm about therapeutic results obtained with this modality has somewhat abated. Excellent work done in this country, notably by Krusen and by Piersol with their collaborators, has furnished reliable information on a number of effects of ultrasound waves on various body tissues, liquids and solids. From a purely biophysical point of view, Dr. J. F. Lehmann, now a fellow in Biophysics at the Mayo Clinic, has given the best picture of the foundation of ultrasonic therapy in the March 1953 issue of the *ARCHIVES.*

The over-all picture at the present time seems to reveal that there is no definite indication that ultrasonic energy, in dosages as applied now, produces any

specific biological effects. The evidence would indicate that ultrasonic energy increases tissue temperatures and is therefore useful in treating conditions which are beneficially influenced by diathermy. Secondary effects which are being produced by ultrasound waves, such as cavitation or formation of gas bubbles, luminescence and various physico-chemical reactions are too weak to create specific effects for the safe dosages used. The work of Hueter and associates at the Massachusetts Institute of Technology has disclosed that ultrasound waves may become of importance diagnostically for the detection of brain tumors or other tumors.

Diathermy

June 30, 1953, has come and gone and the Federal Communications Commissions' order of May, 1947, to confine diathermy equipment to definite bands of frequencies is now law. It is very likely that several thousand illegal machines are still being operated but even the owner of one of the 75 types of F.C.C. approved types and models may not operate his machine entirely without grief. Television which has grown tremendously since the new channels were fixed in 1947, is much more susceptible to interference than radio. Complaints of interference have already been received. In such cases the only possible solution to the problem must result from collaboration by the doctor, the manufacturer (building better shielded sets), the servicing technicians for both television and diathermy, and in some cases, the amateur radio operator who may be the cause of the trouble. One sidethought at the occasion of the mass change-over to new diathermy equipment is the fate of the out-moded apparatus. It is reassuring to learn that many of these machines are being shipped to Israel, India, Latin America, and Korea, where the people do not yet enjoy the blessing of radio and television to such an extent that the "diathermy culprits" can cause interference.

Transistor

Relatively new in the field of physical medicine is the transistor, a small piece of germanium which is a semi-conductor and has the property to conduct electrical currents better in one direction than in the opposite. If it is sufficiently purified and properly wired it can do the work of most of the vacuum tubes but requires only a minute milli-fraction of the current. It has a much longer life and does not need a vacuum nor a filament to keep hot. A number of hearing-aid manufacturers advertise improved hearing-aid models using transistors instead of vacuum tubes although some of the first models have not been proved 100 per cent satisfactory and had to be returned. Apparently the areas of contact of connecting wires with the germanium surface may become contaminated with a subsequent sharp change in sensitivity. But to the biophysicist, future uses of transistors in medical electronic equipment are most intriguing.

Synthetic Organ Mechanisms

Another broad field in which the biophysicist may be greatly interested is the one comprising synthetic organ mechanisms. Such mechanisms are devices which replace, completely or partially, the function of missing or defective organ mechanisms of the human body. You are mostly dealing with artificial limbs, braces, elastic stockings, crutches, hearing aids, wheel chairs, rocking or pulsating bed mechanisms to which eyeglasses, dentures and possibly the seeing-eye dog should be added. Dr. Arthus E. McNeill of the University of Buffalo has enlightened us greatly relative to such synthetic organ mechanisms and extended the list of them to dializers, frequently called artificial kidneys, pumps or artificial hearts, and artificial lungs. A large and important field of research and clinical study has been opened with the construction of these devices.

Pain

One of the most elusive sensations to measure quantitatively and one which the physiatrist meets daily is pain. What is pain and how can it be measured? Many methods for measuring pain have been suggested in the past, but none was found to be generally acceptable. Only

recently has Dr. Hardy of Cornell Medical School and his co-workers constructed a dolorimeter which promises more accurate determination of various degrees of pain. This dolorimeter is a projector which focusses the heat of a 500-watt lamp upon a one square centimeter of ink-blackened skin on the forehead. The sensation which the patient reports is measured in units of heat delivered within three seconds by means of a shutter. Pain threshold had been determined at about 113 F. Ordinarily twenty-one barely perceptible steps can be distinguished until pain becomes unbearable. Two of these steps are called 1 dol and the scale runs from 0 to 10½ dols. It would seem that such a dolorimeter would be useful for physical therapy to follow quantitatively the effect of certain procedures upon pain.

It is challenging to find the rationale of relieving pain by spraying the aching parts with ethyl chloride as sponsored by another member of the Cornell Medical School, Dr. Janet Travell. Are the results as encouraging as observed by Dr. Travell and other physicians at Bellevue Hospital and some veterans hospitals? If so, the physiatrists will certainly accept and use it on many patients; or, will it become as controversial as the Knott Hemo-Irradiator technic for irradiating blood with ultraviolet rays to fight severe infections? Past observations have taught us that it often takes years if not decades until the final decision of the usefulness of a new method in the application of physics to medicine can be made. What has, for example, happened to the negative ion therapy which was so highly advertised almost twenty years ago? Negative ions on minute oil drops were sprayed into the room and the patient who inhaled this charged air for one hour was supposed to have a feeling of exhilaration. Positive ion sprays on the other hand were supposed to produce fatigue, dizziness, and headache. I have in my files hundreds of letters from physicians who reported that they had favorable results with this negative ion therapy in cases of essential hypertension, upper respiratory tract infections, furunculosis, chronic ulcerations of the skin, neurit's and acute and chronic arthritis. One does not hear much about negative ion therapy anymore, although as I understand it, the proper concentration of certain types of ions still presents an important challenge in air-conditioning studies.

Dosage Management

There are, however, two aspects of physical medicine which I would like to mention. One of these concerns the measurement of dosages of energies used in physical medicine and it pertains to various parts of the electro-magnetic spectrum as well as to diathermy and ultrasonics. The dosages of these modalities are usually measured indirectly and few clinical physiatrists have dosage instruments available to measure radiation qualities and quantities directly at the site of application on the patient or in a phantom. A similar situation existed in x-ray and radium therapy about twenty-five years ago when the dose to be applied was calculated from the kilovoltage and the milliamperage at the tube, the filter used, the focal-skin distance and the time of treatment. Careful measurements made in the direct beam demonstrated that for identical conditions of technic, but two different machines or two different tubes, the dosages measured often differed by more than 100 per cent. A dosage unit, the roentgen, was then adopted internationally and dosage instruments were built with which exact measurements could be made on patient or phantom.

Although the question of over- or underdosage with x-rays or other high energy ionizing radiations is more serious than when using ultraviolet or infrared radiation, the principle is the same. Some beginning in developing dosage systems for physical therapy energies has been made. Rovner has mapped out the distribution of heat energy for a number of infrared sources by means of a precision scanner. Other qualitative or spectrometric studies of the various sources of radiation have been made and are available. However, as stated before,

these methods and instruments have not been developed to the point where the physiatrist could quickly use them to study whether the output of a new ultraviolet lamp is the same as the one he used before or whether the two new infrared lamps he just installed have the same energy distribution at a given distance or whether they have undesirable hot spots. It would seem that it is not too difficult to produce such instruments on a scale that they would not be too expensive; their general use would raise still further the scientific level of physical medicine.

Training in Biophysics

The other aspect of physical medicine I would like to discuss briefly is the training of physiatrists in physics. It is very difficult to prescribe exactly what training the physiatrist should have in biophysics. Actually one finds that the training of physiatrists in physics ranges all the way from little or no physics classes to the other extreme, exemplified by several Baruch Fellows who learned how to build rather complicated electronic circuits at one of our leading schools of technology. The correct solution must lie somewhere in the middle.

The radiologists were in somewhat the same situation about twenty years ago. They decided to have a registered physicist examine the candidates for The American Board of Radiology in radiation physics and that has been carried out since the first examination held in 1934. The requirement to take these examinations in physics created a desire for a good text in radiological physics and several books on the subject have been published since then. The result is that the candidates appear remarkably well prepared for their examinations.

In biophysics I feel that it should be more important for the radiologist or physiatrist to know what to do with and how to measure the electric and radiant energies than to know all the details of the apparatus which produces them. Few people are familiar with the circuits of their television sets. Why should they be made to study the intricacies of the production of supersonic energy or the working circuit of an electroencephalograph?

Physiatrists should be able to determine the energies and qualities of any of the modalities which they use. They should correlate these energies with the biological effects produced by them. They should be able to reproduce effects under the same experimental conditions and should find the cause if there are differences in these effects for supposedly identical conditions.

With such a training and practical application of observations made, the physiatrist, even if he did not have a fundamental training in physics, will acquire the "physicist's approach" to his problems, be they practical or experimental. He will cautiously evaluate the observed values, set up control experiments or contratests wherever possible and he will thus arrive at a statistical criterion of the value of new tests or old.

I believe Dr. Frederic Jung of the Council on Physical Medicine and Rehabilitation of the American Medical Association had similar thoughts in mind when he wrote his delightful article, "Two Important Statistical Devices," which was published in the December, 1952, issue of your journal.

If I have been able to give you some glimpses of the impressive strides which physical medicine has taken during the last few decades I am sure that I will have spoken in the spirit of John Stanley Coulter. He deserves a great deal of credit for his share of energy and enthusiasm which brought about this splendid development.

MATTRESSES FOR THE RELIEF OF DECUBITUS ULCERS

HERBERT KENT, Capt., MC, U.S.A.F.
SHEPPARD AIR FORCE BASE, TEXAS*

Medical literature on the subject of special mattresses is lacking except for that secured from leading manufacturers, which is primarily promotional material. Realization of the total period of hospitalization a patient spends in bed, especially one physically disabled, makes any assistance to render their world more tenable worthwhile. Those of us who are interested in this subject may not be able to make a great contribution, but at least we can awaken interest to widen the horizon in this phase of engineering design.

Description

Mattress A (fig. 1) is specially constructed to be used on a *standard hospital* bed. The covering fabric is made of

Formerly Chief, Physical Medicine Rehabilitation, VA Hospital, Indianapolis, Ind.

Sponsored by the Veterans Administration and published with the approval of the Deans Committee. The statements and conclusions published by the author are a result of his own study and do not necessarily reflect the opinion or policy of the Veterans Administration.

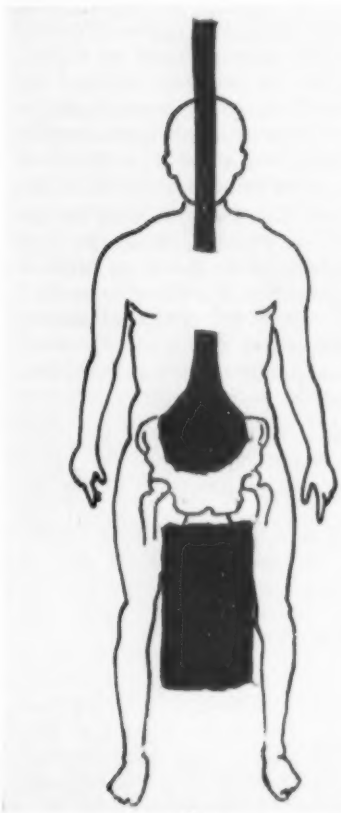


Fig. 1

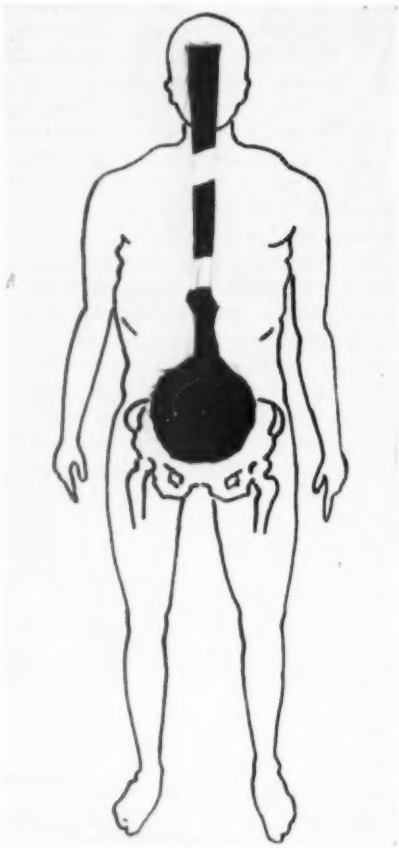


Fig. 2

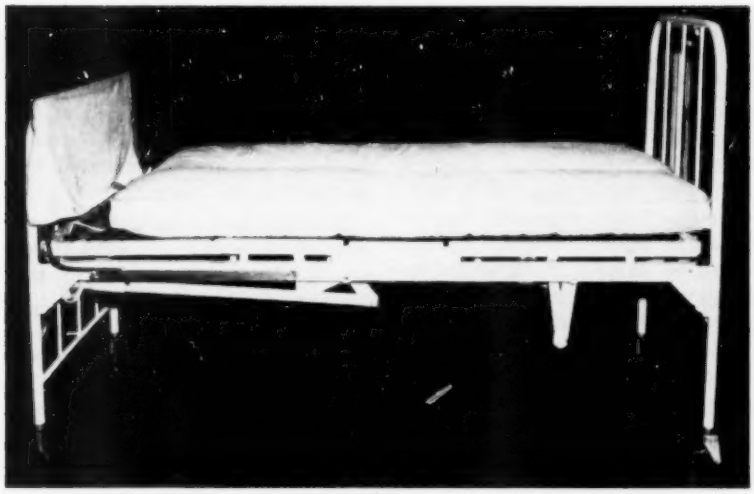


Fig. 3

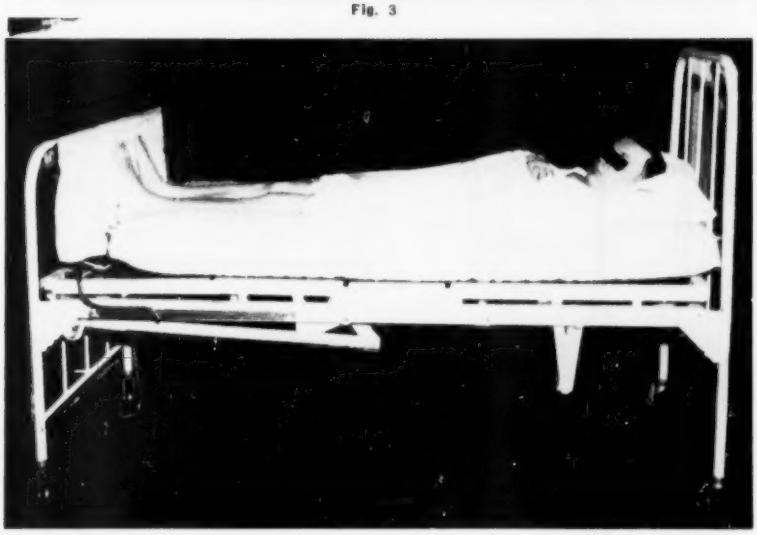


Fig. 4

plastic waterproof material which does not crease readily and can be washed with soap and water without injury. The thickness is similar to that of an ordinary hospital mattress. No tufts are inserted, in order to give a smooth surface. The outside edges are piped for durability. The mattress is designed to relieve pressure in the region of the sacrum and along the spinal column — the region where most decubitus ulcers develop. The opening for the sacrum and spinous processes are of such dimensions as to relieve pressure completely on the bony points, yet at the same time gives sufficient support to the adjacent areas to prevent sinking into the mattress. A connecting piece of material is inserted on the inferior surface to prevent spreading of this aperture. The edges of this particular opening have flat seams and are smoothly rounded to prevent irritation. Another rectangular opening below this serves as a well for the urinal.

Mattress B (fig. 2, 3, 4) is a variation of mattress A and is specially designed

for *orthopedic beds*. It is so constructed that it flexes as the bed is raised or lowered. At the flexion point, the mattress is beveled on the inferior surface in such a manner that when the upper portion of the mattress is brought to a 90 degree angle there is no excess of material. The plastic material is reinforced at this flexion region on the superior surface, where it acts like a hinge to prevent spreading of the aperture for the spinal area. Two connecting supports on the inferior surface are necessary.

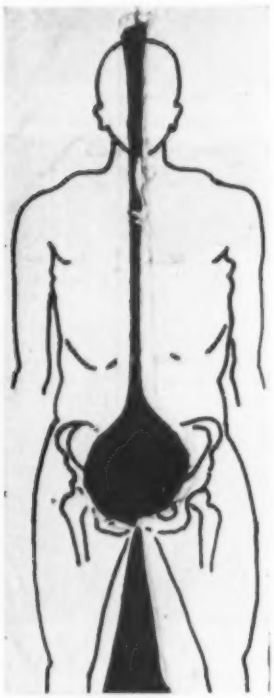


Fig. 5

Mattress C (fig. 5) is a variation of mattress A and is specially designed for a Stryker Frame bed. Tapes are used at the openings to prevent spreading of the edges. This mattress is somewhat thinner than the standard hospital mattress.

Purpose and Use

Mattress A is used to prevent or treat decubitus ulcers. It is particularly valuable for patients who are completely or partially paralyzed, as in quadriplegia. It may also be used with benefit for patients with chronic disabling conditions preventing movement in bed as, for example, arthritis. Toilet and nursing care of these patients is facilitated by the apertures in the mattress.

Mattress B is adaptable for patients who are required to be in the upright or semi-Fowler position, for example, in cardiac or tuberculosis patients. Decubitus ulcers are prevented.

Mattress C allow comfort to patients who have to spend prolonged periods in a Stryker Frame. It also prevents decubitus ulcers as well as enhancing the nursing care.

Acknowlegement is made to Powers and Pittinger, Indianapolis, Indiana, mattress manufacturers, for their generosity and cooperation in the development of these mattresses.

THE PRESENT STATUS OF ULTRASONIC THERAPY

JUSTUS F. LEHMANN, M.D.
ROCHESTER, MINN.

Introduction

This paper represents an attempt to answer the question as to whether an evaluation of ultrasonic therapy is possible at the present time. As a rule, the observed therapeutic effects form the basis for judgment of the efficacy of a new physical agent. However, before a new type of physical energy, such as ultrasound, can be employed therapeutically on human tissue, it is necessary to have a thorough knowledge of its biophysical mode of action. This knowledge is required so that we may know which of the physical phenomena accompanying ultrasonic radiation must be measured quantitatively in order to permit determination of a proper and reproducible dose. In other words, it is important to know which factors in the ultrasonic beam are decisive for the biologic and therapeutic result. Furthermore, knowledge of the biophysical mode of action is necessary in order to apply ultrasonic radiation safely and intelligently.

Biophysics

Heating Effects.—From study of the basic sciences many of the physical, physiochemical and chemical effects created by ultrasonic radiation are known[1-4]. Therefore it was necessary to investigate which of these reactions to ultrasonic energy occurred in vivo and might be effective under conditions used in therapy (frequency about 1,000 kilocycles per second and intensities up to 4 watts per sq. cm. at a radiating surface of the ultrasonic applicator of 5 to 10 sq. cm.). Accordingly, a variety of biologic ultrasonic reactions were studied which were important as a basis for therapy[5-15]. Conditions under which hyperemia, edema, changes in permeability of membranes, alteration of function and electrical excitability of peripheral nerves, changes of metabolism of tissues, and destruction occurred as a result of ultrasonic irradiation were investigated. It was found that the biologic effects of ultrasonic energy were to a large extent dependent on the temperature of the tissues during treatment. These biologic effects were not observed at less than certain critical temperatures. They could be prevented by cooling, even if a fourfold ultrasonic intensity was employed for an eightfold longer period of time than those intensities and durations used in the experiments at higher temperatures. On comparison with the temperature threshold of the reactions after application of heat alone, the rise of temperature in the tissues measured during ultrasonic irradiation was found to be sufficient to explain quantitatively the observed reactions. Also there appeared to be no qualitative difference between the ultrasonic effect and the effect of heating to a corresponding temperature. It was observed finally that heat could be substituted for the ultrasonic energy in order to obtain a diffuse reaction, such as hyperemia. The above-described results are in agreement with recent investigations of others[16-28].

Furthermore, comparison between the reactions after irradiation with pulsed energy and after continuous irradiation was used to distinguish between the mechanical and the thermal component of

Read at the Thirtieth Annual Session of the American Congress of Physical Medicine, New York, N. Y., August 26, 1952.

Fellow in Biophysics, Mayo Foundation, University of Minnesota, Rochester, Minn.

The work on which this paper is based was done at the Max Planck Institute for Biophysics and at the I. Medizinische Universitatsklinik, Frankfurt-am-Main, Germany.

the ultrasonic effect[17]. The percentage of observed hyperemia decreased according to the smaller rise of temperature in the tissues during irradiation with pulsed energy. This occurred in spite of the fact that duration of the experiments with pulsed energy was prolonged so that the total amount of ultrasonic energy applied to the tissues was the same as in the experiments with continuous irradiation. This investigation indicated that the rise of temperature in the tissues was actually decisive for the biologic result. The percentage of hyperemia was plotted against the temperature measured in the tissues during ultrasonic irradiation and during application of heat alone. Mathematical analysis showed that within the limits of statistical error, curves of the reactions to both heat and ultrasound were identical.

The dependence of the reactions on the ultrasonic frequency also suggested that these were due to the rise of temperature resulting from absorption of ultrasonic energy[24]. According to Pohlman[25] and Hüter[26], the coefficient of absorption drops with the decrease of frequency. It was learned that although equal and uniform ultrasonic intensities at both frequencies compared (1,000 and 175 kilocycles per second, 1.7 watts per sq. cm.) were used, the biologic effect was less after application of ultrasound of lower frequency. This was attributed to the smaller rise of temperature measured in the tissues at this lower frequency.

The functional relationship between the amplitude of movement of the elementary particles of the medium in which the ultrasonic energy is transmitted and the occurrence of the biologic effect can be explained by the fact that the ultrasonic waves were absorbed in the tissues and converted into heat and that the heat itself created the biologic reaction[11]. It was found that the relationship between the amplitude of movement of the particles and the temperature of the tissues over the investigated range could be described with sufficient accuracy by the equation of a straight line. When the amplitude of movement of the particles was substituted for the temperature of the tissues in the formula which described the curve of reactions observed after application of heat alone, it was possible to calculate the percentage of the biologic reactions directly from the amplitude of movement of the particles in the ultrasonic waves. It was evident that this calculated curve could be in good agreement with the experimentally observed reactions only if the assumption were correct that the ultrasonic energy was first converted into heat and the heat created the biologic results. The observed reactions and the calculated curve were actually in good agreement.

It was concluded from these experiments that the thermal component of the ultrasonic effect was quantitatively dominant[27–35]. However, because of the variability of biologic reactions and because of the major difficulty in measuring with physical exactness the temperature of the tissues during irradiation it was considered possible that, in addition, there might be non-thermal mechanical effects attributed to ultrasonic energy[7]. Even if they were quantitatively less, to be sure, they might be of some importance for the specificity of the biologic and therapeutic results.

Specific Rise of Temperature at Interfaces.—Differences between the reactions after ultrasonic irradiation and heating to a corresponding temperature have been found[5,13,24]. The most pronounced changes were observed at interfaces between tissues of different acoustic impedance. Measurement of the temperature at these interfaces showed that they were selectively heated during ultrasonic irradiation. The specific heating effect of ultrasonic energy had been already observed by several groups of investigators[22–27]. It can probably be explained by the occurrence of shear waves[28,36]. This characteristic distribution of temperature is dependent upon the high frequencies of the ultrasonic waves. In experiments it vanished when lower frequencies were used or when ultrasonic energy of too low intensity was applied.

This occurred even if the tissues were heated simultaneously in such a manner that the same average temperature of the tissues was obtained[39]. Biologically effective gradients of temperature of several degrees were observed in membranes along a distance of the order of the microscopic structures during ultrasonic treatment. Because of this unique distribution of temperature, this specific heating effect cannot be duplicated exactly by the other forms of diathermy.

Nonthermal Effects. — Furthermore, to a certain extent, the specificity of the ultrasonic reactions is based on nonthermal effects. It was demonstrated that the permeation of ions in membranes was increased during and after ultrasonic irradiation[30-42]. The irreversible increase of the permeability of the membrane might be explained entirely by the heating effect of ultrasonic energy. But when controls were treated by employing heat alone to raise the temperature to a corresponding level, the rise of temperature during irradiation was not sufficient to reproduce quantitatively the ultrasonic effect on the permeation of ions. It seemed evident that there was another mechanical factor, a stirring effect of ultrasonic energy, which decreased the layer of diffusion and therefore augmented the passing of ions. However, the ultrasonic effect on the permeation of ions through biologic membranes as a whole was also highly dependent upon the temperature.

Cavitation. — Further investigations showed that the occurrence of cavitation could not produce the therapeutic results, because cavitation is prevented by those conditions which are encountered in therapy, namely, the high frequency of the ultrasonic waves, the great volume percentage of cells in the organs and finally the high viscosity of the liquids of the body[43,44].

In summary, it can be said that the heating effect of ultrasonic energy plays the major role quantitatively in creating biologic reactions under therapeutic conditions. However, the distribution of temperature in the living organism is a highly specific one. The biologically and therapeutically important interfaces between tissues of different acoustic impedance are selectively heated. Biologically effective gradients of temperature occur along microscopic structures. So far as is known at the present time, this specific heating effect cannot be replaced by any other form of diathermy. Furthermore, this specific heating is dependent on the high frequencies of the ultrasonic waves. In addition there are nonthermal mechanical effects which are quantitatively less than the thermal effects. However, the mechanical effects may be of importance, since they produce certain specific biologic effects. For instance, the diffusion of ions is increased by a stirring effect of ultrasonic energy, but as a whole this effect of permeation is also dependent on the temperature.

Determination of a Therapeutic Dose

Therefore, in therapy it is necessary to apply ultrasonic energy in such a manner that a sufficient rise of temperature is created in the tissues in order to produce a biologic effect. For the measurement of a dose, it is important to determine all variables in such a way that the desired rise of temperature in the tissues is created[45]. On the other hand, overdosage with consequent damage to tissues can be avoided if burning at the interfaces is prevented.

Therapeutic Results

Even though the specificity of the biophysical mode of action of ultrasonic energy suggests that specific therapeutic results can be obtained, nevertheless, further clinical studies will be necessary before definite conclusions can be drawn.

Since therapeutic results alone form the basis for the final evaluation, the results of this new type of therapy as far as they are available at the present time will be discussed with special regard to the following questions: 1.—Is ultrasonic energy therapeutically effective at all?; 2.—is it superior to other forms of diathermy, at least in some instances, as might be expected because of

its specific biophysical mode of action?; 3.—is it possible by its use to improve conditions which are difficult to influence by other forms of therapy or which have been proved previously to be resistant to treatment with other methods?, and 4.—can one conclude from the results of biophysical research that irradiation can be performed safely?

An attempt will be made to answer these questions with a few examples taken from statistical studies. The first example is a statistical study performed in Erlangen in 1949 on the effects of ultrasound on sciatica[46]. The term "sciatica" is understood to mean that the patients showed the typical syndrome; evidence that the condition is due to a mechanical cause, such as a slipped disk, was not so marked that surgical treatment was immediately necessary. The immediate results of ultrasonic treatment are indicated in table 1. These results have been corroborated by various studies of many authors[47-58] (table 2). The results suggested that ultrasonic energy was therapeutically effective. However, the evidence presented in these statistical studies was not sufficiently complete for a final evaluation of ultrasonic therapy. None of these studies provided statistical comparison between ultrasonic irradiation and other forms of therapy. Therefore, of each three patients admitted to the hospital with the diagnosis of sciatic syndrome, the first and second were treated with other available therapeutic methods and the third patient was treated with ultrasonic energy alone[46]. In this study the term "healed" was used to mean that all objective and subjective symptoms had

TABLE 1. — Immediate Results of Ultrasonic Treatment of "Sciatica" in One Series.

	PATIENTS		RESULT			
	Total	Without complaints or cured	Improvement	No change	Exacerbation	Evaluation impossible
Patients	1,508	931	343	156	8	70
Percentage	100	62	23	10	0.5	4.5

TABLE 2. — Results of Ultrasonic Treatment of Patients With "Sciatica" as Reported by Various Authors.

Total patients	RESULT: No complaint	Improvement	Failure	Evaluation impossible	Treatment	Author
187	152	13	8	14	1,000 kcps; 3 watts/sq. cm.; 10-15 min.; 15 times	Demmel[47,48]
50	42	0	4	4	800 kcps; 1,000 volts; 10 times	Parow-Souchon[49]
50	14	20	0	16	800 kcps; 1-2 watts/sq. cm.; 10 min.; 10-15 times	Scholtz and Winde[50]
15	5	5	5	0	10 min.; 15 times	Henkel[51,52]
28			3	0	1,000 kcps; 3 watts/sq. cm.;	Müller[53]
26	23	23	3	0	10 min.; 10 times	
65	57	8	0	0	1,000 kcps; 3 watts/sq. cm.; 10 min.; 15 times	Wiegmann[54]
108	92	15	1	0	800 kcps; 10-15 min.; 12 times	Horvath[55]
19	19	0	0	0	1,000 kcps; 3 watts/sq. cm.; 10 min.; 10 times	Stoltz[56]
58	7	23	13	15	———	Barth and Wachsmann[57]
9	4	4	1	0	806 kcps; 5,000 volts; 10 times	Pohlman, Richter and Parow[58]
105	71	34	0	0	1,000 and 800 kcps; 10 min.; 6-12 times	Ungeheuer[52]

disappeared. The difference between the results obtained in the two groups, evaluated with the T test of Schelling[59], were statistically significant (tables 3 and 4).

TABLE 3. — Results of Ultrasonic Treatment of Sciatic Neuritis: Patients With and Without Complaints.

Treatment	Patients Without complaints	With complaints	Sum
Ultrasonic waves only	16 (64%)= a11	9 (36%)= a12	25 (100%)= a1
Other	13 (26%)= a21	37 (74%)= a22	50 (100%)= a2
Sum	$29 = A_1$	$46 = A_2$	$75 = N$

TABLE 4. — Results of Ultrasonic Treatment of Sciatic Neuritis: Patients With "Healed" and "Unhealed" Lesions.

Treatment	Healed	Not healed	Sum
Ultrasonic waves only	13 (52%)= a11	12 (48%)= a12	25 (100%)= a1
Other	6 (12%)= a21	44 (88%)= a22	50 (100%)= a2
Sum	$19 = A_1$	$56 = A_2$	$75 = N$

These results suggest that ultrasonic therapy is superior, in this particular group of cases, to the other forms of treatment, especially if we consider that all patients had undergone treatment for a period of several months prior to admission, without benefit. However, for a final evaluation it is necessary that this statistical study of a small group of patients be corroborated by a study of a greater number of cases.

In tables 5 and 6, the results of ultrasonic treatment of disorders which are difficult to influence by other means, namely, roentgen ulcers and rheumatoid spondylitis, are demonstrated. These studies also were performed in Erlangen in 1949[60]. Similar observations were made by others[47,48,57,61,62]. The results suggest that ultrasonic energy is valuable in the treatment of such conditions as roentgen ulcers and spondylitis. But, again, these statistics do not allow a comparison with other forms of therapy and they must be confirmed in a greater number of cases.

Hazards of Ultrasonic Therapy

The incidence of exacerbation of the complaints in all these statistical studies is so small as to make it appear likely that the exacerbations had nothing to do with the treatment itself. Probably the relapses would have occurred with or without any treatment. That ultrasonic irradiation can be applied safely in large numbers of cases is indicated by a recent study of 5,000 patients by Pezold[63]. If the known indications and contraindications were strictly respected, no damage due to the ultrasonic treatment was observed. Furthermore, it is thought the observations presented at the beginning of this study indicate that a knowledge of the biophysical mode of action is necessary in order for the physician to apply ultrasonic therapy safely[64].

Summary

The biophysical basis of ultrasonic therapy has now been investigated sufficiently to permit determination of a reproducible and suitable dose and to allow safe administration of treatment in most instances provided that it is applied by a skilled physician. Since it has been demonstrated in the laboratory that there are definite specific biophysical effects, one may surmise that certain specific therapeutic results might also be obtained. The results of statistical studies of the therapeutic effects of ultrasonic

TABLE 5. — Results of Ultrasonic Treatment of Roentgen Ulcers.

	Total patients	RESULT Marked improvement or cure	Improvement	No change	Exacerbation	Evaluation impossible
Patients	51	22	14	10	2	3
Percentage	100	43	27	20	4	6

TABLE 6. — Results of Ultrasonic Treatment of Spondylosis Chronica Ankylopoietica (Marie-Strümpell).

	Total patients	RESULT Marked improvement	Improvement	No change	Exacerbation	Evaluation impossible
Patients	536	21	413	74	6	22
Percentage	100	4	77	14	1	4

energy perhaps may also be interpreted as suggesting that certain specific therapeutic results might be obtained. They suggest also the therapeutic efficacy of this new type of physical agent, but the statistical studies which are available are not sufficient for a final evaluation. On the other hand, these studies lead to the assumption that ultrasonic therapy may be of value in the physical treatment of certain disorders and lend encouragement to further investigation.

References

1. Bergmann, Ludwig: Der Ultraschall und seine Anwendung in Wissenschaft und Technik, ed. 5, Stuttgart, S. Hirzel Verlag, 1949, p. 748.
2. Lehmann, J. F.: Der Therapie mit Ultraschall und ihre Grundlagen. Arch. d. phys.-diätet. Therap. **4**:196, 1951.
3. Blake, F. G.: The Tensile Strength of Liquids. June 11, 1949. Office of Naval Research. Contract N. 50 R. 1-76, Project Order X, NR-014-903. Acoustics Research Laboratory, Harvard University, Cambridge, Mass.
4. Sollner, Karl: Sonic and Ultrasonic Waves in Colloid Chemistry. In Alexander, Jerome: Colloid Chemistry, Theoretical and Applied, New York, Reinhold Publishing Corporation, 1944, vol. 5, pt. 1, chap. 15, pp. 337-373.
5. Lehmann, Justus: Beitrag zur therapeutischen Ultraschall-Wirkung. Strahlentherapie. **82**:281 (July 5) 1950.
6. Lehmann, Justus: Über die Temperaturabhängigkeit therapeutischer Ultraschallreaktionen unter besonderer Berücksichtigung der Wirkung auf Nerven. Strahlentherapie. **79**:543 (July 13) 1949.
7. Lehmann, Justus, and Vorschütz, Rosemarie: Die Wirkung von Ultraschallwellen auf die Gewebeatmung als Beitrag zum therapeutischen Wirkungsmechanismus. Strahlentherapie. **82**:287 (July 5) 1950.
8. Lehmann, J. F., and Hohlfeld, R.: Der Gewebestoffwechsel nach Ultraschall und Wärmeeinwirkung. Strahlentherapie. **87**:544, 1952.
9. Lehmann, Justus, and Becker, Georg: Über die permeabilitäts-steigernde Wirkung von Ultraschallwellen auf biologische Membranen. Strahlentherapie. **79**:553 (July 13) 1949.
10. Lehmann, Justus, and Vorschütz, Rosemarie: Über die biologische Wirksamkeit des Impulsschalles als Beitrag zum therapeutischen Wirkungsmechanismus der Ultraschallwellen. Strahlentherapie. **81**:639 (May 5) 1950.
11. Lehmann, Justus, and Feissel, H. J.: Über die Abhängigkeit biologischer Ultraschallreaktionen von der Teilchenamplitude als Beitrag zum therapeutischen Wirkungsmechanismus. Strahlentherapie. **82**:293 (July 5) 1950.
12. Lehmann, Justus, and Feissel, H. J.: Inwieweit lässt sich die Ultraschall-Leistung durch Zufuhr von Wärmeenergie in ihrer biologischen Wirkung ersetzen? Strahlentherapie. **85**:615 (Oct. 30) 1951.
13. Lehmann, J. F.; Becker, G., and Otto, J.: Thermische und mechanische Wirkungen des Ultraschalles auf einzelne Zellen, untersucht am Beispiel der eosinophilen Leucocyten. Strahlentherapie. **87**:550, 1952.
14. Lehmann, J. F., and Koester, E.: Die Abhangigkeit der hyperaemisierender Ultraschallwirkung von der Beschallungszeit. Strahlentherapie. **92**:159, 1953.
15. Lehmann, Justus, and Finsterwalder, Gerta: Über die Denaturierung der Serumeiweisskörper durch Ultraschall und Wärme mit besonderer Berücksichtigung der Komplement-funktion. Arch. f. exper. Path. u. Pharmakol. **206**:314, 1949.
16. Dittmar, Carl: Über die Wirkung von Ultraschallwellen auf tierische Tumoren. Strahlentherapie. **78**:217 (Nov. 12) 1948.
17. Barth, G.; Pätzold, J., and Wachsmann, F.: Über den Wirkungsmechanismus biologischer Ultraschallreaktionen. I. Möglichkeiten zur Klärung der Wirkungsmechanismus. Strahlentherapie. **80**:305 (Oct. 10) 1949.
18. Barth, G.; Erlhof, H., and Streibl, F.: Über den Wirkungsmechanismus biologischer Ultraschallreaktionen. II. Impulsversuche mit Ultraschallhämolyse. Strahlentherapie. **81**:129 (Feb. 10) 1950.
19. Barth, G., and Wachsmann, F.: Über den Wirkungsmechanismus biologischer Ultraschallreaktionen. III. Untersuchungen bei verschiedener Umgebungstemperatur. Strahlentherapie. **81**:649 (May 5) 1950.
20. Pfander, Friedrich: Durch Ultraschall ausgelöster thermischer Nystagmus. HNO (Beihefte z. Ztschr. f. Hals-Nasen- und Ohrenheilkunde). **1**:512 (Nov.) 1949.
21. Theismann, Hans: Beitrag zur Frage der biologischen Wirkung des Ultraschalls. Strahlentherapie. **79**:559 (July 13) 1949.
22. Hueter, T. F.: Dyer, J.; Ludwig, G. D., and Kyrazis, D.: Thresholds of Damage in Nervous Tissues. Massachusetts Institute of Technology, Quarterly Progress Report. (Oct.-Dec.), 1950.

23. Treanor, W. J.; Lambert, E. H.; Herrick, J. F., and Krusen, F. H.: Comparative Study of the Effects of Heat and Ultrasound on Nerve Conduction. Unpublished data.
24. Lehmann, Justus, and Nitsch, Willi: Über die Frequenzabhängigkeit biologischer Ultraschall-Reaktionen mit besonderer Berücksichtigung der spezifischen Temperaturverteilung im Organismus. Strahlentherapie. 85:606 (Oct. 30) 1951.
25. Pohlman, R.: Über die Absorption der Ultraschalles im menschlichen Gewebe und ihre Abhängigkeit von der Frequenz. Phys. Ztschr. 40:159, 1939.
26. Hüter, T.: Messung der Ultraschallabsorption in tierischen Geweben und ihre Abhängigkeit von der Frequenz. Naturwissenschafte. 35:285, 1948.
27. Lehmann, J.: Über die Temperaturabhängigkeit therapeutischer Ultraschallreaktionen. In Matthes, K., and Rech, W.: Der Ultraschall in der Medizin, Zürich, S. Hirzel Verlag, 1949, vol. 1, pp. 159-164.
28. Lehmann, Justus: Die biophysikalischen Grundlagen therapeutischer Ultraschallwirkungen. In Woeber, Karlheinz: Der Ultraschall in der Medizin, Zürich, S. Hirzel Verlag, 1950, vol. 2, pp. 5-9.
29. Lehmann, J. F.: Ueber biophysikalische Grundlagen therapeutischer Ultraschallwirkungen, Supplemento al vol. VII, Serie IX, del Nuovo Cimento, 1950.
30. Lehmann, J. F.: Die biophysikalischer Grundlagen der Ultraschalltherapie. Verhandl. d. deutsch. Gesellsch. f. inn. Med. 57:414, 1951.
31. Lehmann, J. F.: Ultraschallbehandlung. Die Umschau. 49:609, 1949.
32. Freundlich, H.; Söllner, K., and Rogowski, F.: Einige biologische Wirkungen von Ultraschallwellen, Klin. Wchnschr. 11:1512 (Sept. 3) 1932.
33. Wood, R. W., and Loomis, A. L.: Physical and Biological Effects of High-frequency Sound Waves of Great Intensity. Phys. Rev. 29:373 (Feb.) 1927.
34. Wood, R. W., and Loomis, A. L.: The Physical and Biological Effects of High-frequency Sound-waves of Great Intensity. Philosophical Mag. s. 7, 4:417 (Sept.) 1927.
35. Horvath, J.: Experimentelle Untersuchung über die Verteilung der Ultraschallenergie im menschlichen Gewebe. Arztl. Forschung. 1:357, 1947.
36. Herrick, J. F.; DeForest, R. E.; Janes, J. M., and Krusen, F. H.: Effects of Ultrasonic Energy on Growing Bone. Federation Proc. 10:62 (Mar.) 1951.
37. Bender, L. F.; Herrick, J. F., and Krusen, F. H.: Temperatures Produced in Bone by Various Methods Used in Ultrasonic Therapy: An Experimental Study. Arch. Phys. Med. & Rehab. 34:424 (July) 1953.
38. Oestreicher, H. L.: Symposium on "Ultrasound in Biology and Medicine," May 25-29, 1952, Urbana, Illinois, University of Illinois.
39. Lehmann, J. F.: The Biophysical Mode of Action of Biologic and Therapeutic Ultrasound Reactions. J. Acoustical Soc. America. 25:17, 1953.
40. Lehmann, Justus: Die Spezifität der biologischen und therapeutischen Ultraschallwirkung. Arch. f. phys.-diätet. Therap. 3:57 (Mar.-Apr.) 1951.
41. Lehmann, Justus, and Becker, Georg: Über histologische Veränderungen nach Ultraschall und anderen physikalischen Einwirkungen bei Permeabilitätsuntersuchungen an der Froschhaut. Strahlentherapie. 84:306 (Mar. 22) 1951.
42. Lehmann, Justus; Becker, Georg, and Jaenicke, Walther: Über die Wirkung von Ultraschall-Wellen auf den Ionendurchtritt durch biologische Membranen als Beitrag zur Theorie des therapeutischen Wirkungsmechanismus. Strahlentherapie. 83:311, 1950.
43. Lehmann, Justus: Beitrag zur Ultraschallhämolyse. Strahlentherapie. 79:533 (July 13) 1949.
44. Lehmann, Justus: Die Wirkung des Ultraschalls auf die Formelemente des Blutes. In Woeber, Karlheinz: Der Ultraschall in der Medizin, Zürich, S. Hirzel Verlag, 1950, vol. 2, pp. 18-21.
45. Lehmann, J. F.: Die Beziehungen zwischen therapeutischer Dosis und biophysikalischer Wirkung der Ultraschallwellen. In Woeber, Karlheinz: Der Ultraschall in der Medizin, Stuttgart, S. Hirzel Verlag, 1951, vol. 3, p. 24.
46. Matthes, K; and Rech, W.: Der Ultraschall in der Medizin, Zürich, S. Hirzel Verlag, 1949, p. 379.
47. Demmel, R.: Erfahrungen mit Ultraschallbehandlung. Deutsche Med. Rdschau. 2, 7:241, 1948.
48. Demmel, R.: Mitteilungen der Firma Ultrakust., 3, 5, 1948.
49. Parow-Souchon, E.: Ultraschall in der Therapie. Ztschr. f. ärtzliche Fortbildung. 39:362, 1942.
50. Scholtz, H. G; and Winde, D.: Ultraschall in der Rheumabehandlung. Z. Rheumaforsch. 7:130 (Apr.) 1944.
51. Henkel, K.: Meine Erfahrungen mit Ultraschall zur Behandlung von Neuritis und Asthma. Strahlentherapie. 77:291 (Dec. 15) 1947.
52. Henkel, K.: Indikationen zur Anwendung der Ultraschalltherapie. Schweiz. Rundschau f. Med. Praxis. Bern, 13, 1949.
53 Müller, J.: Erfahrungen mit Ultraschall-

therapie, Mitt. der. Firma Ultrakust., 3, 1948.
54. Wiegmann, I: Heilerfolge mit Ultraschallwellen, Ultrakust Mitteilungen. 1947, p. 2.
55. Stoltz: Quoted by Lehmann, J. F.[8]
56. Pohlman, R.; Richter, R., and Parow, E.: Über die Ausbreitung und Absorption des Ultraschalls in menschlichen Gewebe und seine therapeutische Wirkung an Ischias und Plexusneuralgie. Deutsche med. Wchnschr. 65(pt. 1):251 (Feb. 17) 1939.
57. Ungeheuer, E.: Unsere Erfahrungen mit Ultraschall, Strahlentherapie. 79:619 (July 13) 1949.
58. Lehmann, Justus: Über den Wert der Behandlung der schweren Ischiasneuritis mit Ultraschallwellen. Deutsche med. Wchnschr. 75:1624 (Dec.) 1950.
59. Von Schelling, H.: Die Beurteilung der Treffsicherheit von Prognosen. Deutscher statistisches Zentralbl. 27:141, 1935.
60. Matthes, K., and Rech, W.: Der Ultraschall in der Medizin, Zürich, S. Hirzel Verlag, 1949, p. 373-392.
61. Hintzelmann, U.: Ultraschalltherapie rheumatischer Erkrankungen. Deutsche med. Wchnschr. 72:350 (July) 1947.
62. Horatz, Karl: Erfahrungen mit der Ultraschallbehandlung. Strahlentherapie. 79:635 (July 13) 1949.
63. Pezold, F. A.: Zur Frage des Ultraschallschadens. In Woeber, K. H.: Der Ultraschall in der Medizin, Stuttgart, S. Hirzel Verlag, 1952, vol. 4, pp. 1-28.
64. Lehmann, J. F.: Ist die Kenntnis der biophysikalischen Wirkungsmechanismus der Ultraschalles zur Vermeidung von Schädigungen bei der Therapie notwendig? In Woeber, Karlheinz: Der Ultraschall in der Medizin, Stuttgart, S. Hirzel Verlag, 1952, vol. 4, p. 34.

Discussion

Dr. Fritz Friedland (Framingham, Mass.): Dr. Lehmann's interesting report is apparently the first paper on the therapeutic application of ultrasonics to originate from the Mayo Clinic. It is a privilege to discuss this paper on its two phases, namely the physiologic effect mechanism of ultrasonics and the therapeutic efficacy.

During the past three years we have used ultrasonic therapy clinically for such conditions as subdeltoid bursitis, low back strains with and without sciatic neuralgia, ruptured intervertebral discs, traumatic conditions, Marie-Strumpell spondylitis, peripheral neuritis, degenerative arthritis, and rheumatic myositis. From our observations, we formed the opinion that the therapeutic effect of ultrasound is very similar to the effect of heating by various means. We concluded that at least in the treatment of human diseases the heat effect and the resulting hyperemia cannot be excluded and therefore, any additional non-thermal response to ultrasonics can neither be proved nor demonstrated by clinical research. Nevertheless, there does not seem to be any doubt that under special experimental laboratory set-ups, non-thermal mechanical effects of ultrasonics can be demonstrated, but how far and whether such phenomena influence the therapeutic effect is more than questionable. It is, therefore, interesting to note that Dr. Lehmann, from the point of his biophysical experiments, arrived at the same conclusion. His arguments are well taken. Since pulse sounding permits convection of heat during the "off" phases, the observation that such a method results in a decreased biologic response merits the convincing deduction that the chief ultrasonic effect is thermal in nature. On the other hand, the observation that cooling suppresses or prevents the ultrasonic effect does not, in my opinion, warrant the same conclusion. Of course, cooling is the physical opposite of heating. However, that does not necessarily mean that cooling as a physical agent could not also be the opposing force to other non-thermal mechanical energies.

Referring to the evaluation of the results of ultrasonic therapy applied to sciatic neuritis, I can confirm the favorable findings as reported by Dr. Lehmann. However, statistically our results were only slightly in favor of ultrasonic therapy compared with control cases fared better than those reported by therapeutic methods. Thus, our control cases fared better than those reported by Dr. Lehmann. It appears to me that in sciatic neuritis or sciatic neuralgia—even if left untreated—the percentage of spontaneous recovery within a certain time should be larger than 12 or 26 per cent as shown in Dr. Lehmann's tables.

Therefore, the question presents itself whether the results reported are actual end results after the patient has received maximum benefit from whatever type of physical therapy is being applied or whether these results represent the condition of the patient after a certain number of treatments has been given. In the latter case, the tables could be possibly interpreted as indicating that with the use of ultrasonic therapy maximum benefit could be obtained in a shorter time or after fewer treatments than with the use of other physical therapeutic measures. This observation was made in some of our studies.

It also seems questionable whether it is justifiable to list all cases of sciatic neuritis in one group independent of the fact whether or not there is evidence of a ruptured intervertebral disc. Since ultrasonic therapy like most other physical therapeutic methods is non-specific in its effect, we also thought it reasonable to assume that symptomatic relief in sciatica could be equally well obtained in cases with or without herniated disc. However, after dividing our cases of sciatic neuritis into these two groups, we found that the therapeutic results in the disc cases were unsatisfactory with either type of treatment. This could possibly explain the statistical difference between our control cases and those reported by Dr. Lehmann.

With regard to the therapeutic application of ultrasound, a few questions will be of general interest:

1. What is Dr. Lehmann's opinion regarding the two different modes of applying ultrasonic therapy, namely the massaging sound head application and the stationary sound head application?; 2. What constitutes a suitable and safe dose?, and 3. Should a series of treatments be started with the full dose or with a lower intensity, to be gradually increased to an optimal dosage, according to the patient's response?

AN INTENSIVE EXERCISE PROGRAM FOR USE IN KNEE SURGERY AND PATHOLOGY

C. DeWITT DAWSON, M.D.
JACKSON, MISS.

Introduction

"The road out of the woods is just as long as the road into the woods," an old Mexican proverb related to diseases in general, emphasizes the well recognized truth that the longer disease exists in the body, the greater the time required for recovery. A coexistent fact of great importance is that, the longer the disease exists in the body, the greater the tissue destruction, and the less likely complete recovery. The truth of these statements finds most ready acceptance in connection with treatment of acute and virulent infectious processes. They are very rarely appreciated, but equally true, when one is treating lesions arising from trauma or from altered physiologic functions.

Physiology of the Knee

Few people realize the importance in human physiology of normal stress and strain. The whole body is adjusted to the upright position and the bearing of weight by the lower parts of the body and extremities. Rest and relaxation are also important, and often are the most pleasant phases of the physiologic process, but if by reflex action or by artificial restraint an extremity is immobilized, changes to the abnormal occur with astounding rapidity. Following injury to the knee, there is immediate effect upon the thigh muscles, especially the quadriceps, and Ghormley[1] says that within twenty-four hours, atrophy and wasting are very notable and measurable. Cecil's Textbook of Medicine[2] states that the normal stresses and strains on the bony skeleton are found to be an essential stimulus to osteoblastic activity, and that any factors, such as immobilization, which decrease these forces very early, lead to disuse atrophy and osteoporosis. Within twenty-four hours, the bone matrix begins to lose its osteoplastic activity, with decreased power to retain the essential proteins of which the matrix is composed. Within seventy-two hours the protein-calcium balance is markedly affected, so that calcium can no longer be bound normally to a protein-deficient residual bone structure. In a scant three weeks, the whole picture is prime for the overload of free-circulating calcium in the blood, which leads to kidney stones. A third important pathologic change is in the cartilage and joint synovium. In an immobilized joint, the cartilaginous surface becomes softened, whether at the points of pressure of articulation or bathed in synovial fluid. It becomes thinner, subject to injury, with possible hemorrhage, and loses much of its absorptive function, so that hemorrhagic or synovial fluid collects in the joint. The cartilage loses its smoothness, becomes "sticky" and adherent to surfaces contacted. The joint becomes stiff, often swollen, and the tissue "insult" of movement is painful, especially at its beginning. On the other hand, normal articular movement soon restores absorptive powers. The amount of hydrarthrosis often varies inversely with the amount of joint movement practiced.

Mechanics of the Knee Joint

The mechanics of the knee joint are reviewed chiefly to call attention to the fact that it is not a simple hingejoint as many suppose, but that this function is accompanied by an external rotation in flexion, internal rotation in extension. This is the "screwing home," or the locking of the knee for perfect function and

Read at the Thirtieth Annual Session of the American Congress of Physical Medicine, New York, N. Y., August 29, 1952.

Chief, Physical Medicine Rehabilitation Service, Veterans Administration Center, Jackson, Miss.

stability. The knee is held in any desired position in its range of motion by elements which are passive and those which are active. The passive elements are the articular capsule, with tendinous reinforcements, the several ligaments, and the menisci. These buttress and hold the femoral condyles and tibial plateau throughout the full excursion from flexion to full extension. The passive elements are affected and partly controlled by the active elements, which stabilize and affect all movements of the joint. Principally, the muscles are—quadriceps, biceps femoris, and hamstrings. Assisted by the gracilis, sartorius, plantaris, and popliteus, they produce flexion, extension, internal and external rotation of the lower leg on the thigh. The most active stabilizer, or "maker" of the knee joint, is the quadriceps, which extends the knee through its "quad" elements, the vastus lateralis, rectus femoris, vastus intermedius and medialis. The medialis is responsible for the last 10-15 degrees of extension which is so essential to solid locking of the joint in the weight-bearing position. As stated elsewhere, its condition largely determines the "strong" or the "weak" knee. This strong muscle group inserts into the patella, and also, through lateral and medial expansions, into the joint capsule. In this way it strengthens and supplements the passive action of the ligaments and other structures of the joint.

The Time Element in Progressive Knee Deterioration and Restoration

1. *General*: Until recently, the great importance of time was not fully appreciated, and the contribution of the multiplied professional experience in dealing with large numbers of war wounded is inestimable. Ghormley[3] reviews 120 arthrotomies performed upon soldiers, in which the average time absent from duty in a forward area was 80 days. Twenty-five, or more than 20 per cent, did not return to full duty. Six or 11 per cent of the 56 who returned to front line duty suffered from recurrence of joint effusion, pain and instability, and required further prolonged hospitalization. This prolonged treatment time is repeated in many other reports. Schwartz noted that in the presence of hemarthrosis, the knee was practically paralyzed as a reflex mechanism to protect the synovium against the painful insult of movement, and that the atrophy of the quadriceps was astoundingly rapid as a part of this "protection," making voluntary movement "impossible." He observed that this atrophy dominated the functional outcome, and if not appropriately treated, resulted in recurrent hydrarthosis. Immediate, energetic, and oft-repeated quadriceps exercise is stressed as the "sine qua non" of prevention and treatment.

2. *Septic Arthritis*: Smith, Olive, and Guthrie's book on Remedial Exercises[5] states that one of the most difficult treatment problems of physical therapy is the restoration of movement to a knee which has been septic and has become stiffened. The quadriceps will always waste if the lower limb is immobilized for any length of time. Even mild static or setting exercises without knee joint movement will check this wasting, will contribute to the resorption of joint fluid, and will hasten the time when gentle, active joint movement may be initiated. The quadriceps setting exercises can gradually be increased to strenuous, while active movement is very slowly increased so that joint and muscles will have the feeling of "togetherness" as natural joint movement and strength return.

3. *Traumatic Injuries; Patellar Fracture; Surgery*: Hans Kraus[4] insists that, after patellar fracture, dislocation of the knee joint, and many other injuries, immediate mobilization is nearly always indicated. The first step in treatment is the preservation of muscle power of the quadriceps. If arthrotomy is indicated, pre-operative preparation should be used except in emergency, with special emphasis on the vastus medialis, to preserve full extension. Quadriceps setting should be begun pre-operatively and immediately post-operatively; the greatest protection against recurrent injury is a strong quadriceps with predominantly strong vastus medialis. It is the first to

lose strength, the slowest to regain *full* strength. Lipscomb[7], reporting his series of cases of operation for ruptured menisci, found a good many dissatisfied patients, who said, "The locking is relieved, but the 'weakness' is not helped." He joins others in observing that a strong quadriceps mechanism is the means of relieving the instability of which complaint is so common.

The "Fourteen Day Prescribed Treatment Regimen"

1. *History*: The writer of this article claims no credit for the development of the successful treatment program in which he has been an enthusiastic participant for three years. Dr. Thomas S. Robertson, Chief, Orthopedic Service, Veterans Administration Hospital, Jackson, Mississippi, began in 1947 the development of a fixed regimen of pre- and post-operative exercises for his knee cases which came to surgery with the well experienced aid of Mr. John M. Hawk, Chief of Corrective Therapy, Physical Medicine Rehabilitation Service, who had had a good deal of experience in the application of selective exercise therapy in knee cases while in military service. The data here supplied, and part of the material presented, are taken from the professional article[6] presented before their respective professional bodies by these two alert and progressive associate hospital staff members. With some trial and error, and with due credit to the work of others, especially Dr. T. L. DeLorme[8], for the emphasis upon preoperative exercise program, the present system has been found to give excellent results in a high percentage of the 85 cases coming to surgery, and of 20 additional cases which were treated without surgery. The latter usually make excellent progress under a strenuous exercise therapy program, with increased quadriceps strength, more knee stability, and thus protection from subsequent injuries.

2. *Exercise Therapy Regimen*: If possible, the patient is referred for exercise therapy while awaiting scheduled surgery on the knee, or at times, as an aid in the determination of the necessity for operation. Time is taken, both by the doctor and the therapist, to explain to the patient the reasons for the use of a strenuous exercise program, the relative great importance of the quadriceps in the strength and stability of the knee, and the necessity for him to work "overtime and all the time" for a good, strong quadriceps. He is instructed to set these muscles 50 or more times each hour while awake. It can be done supine, sitting, or standing, preferably supine. He is told that this will be the first exercise he will do after his operation. The post-operative treatment regimen is also outlined to him in order that he may have answers to the inevitable questions as to when he can move his knee, when he can stand, walk, bear weight, etc. He is made to understand that his relative cooperation may well determine the answer to "When will I go home?". He is told that he can expect some pain, but without injury to the joint, and that the pain will disappear more quickly and permanently with the exercises, which are all explained to him before operation.

As the purpose of exercise therapy before and after operation is the prevention of, or recovery from muscle atrophy, and to increase joint function, each patient is measured for thigh circumference five inches above the knee, and for range of motion, at the beginning of treatment; this is continued at regular intervals during treatment. Often there is benefit and stimulation if the patient keeps up with his score. As quadriceps weakness is usually present, the method of DeLorme[8] is followed closely, using for strength, maximum resistance and low repetition. Heavy resistance is prescribed three times a week on alternate days. For endurance and joint range increase, stationary bicycle riding, knee bends, and active leg exercises are used on other days. Often, unless there is considerable tenderness, the thigh circumference will increase one-fourth inch in a week to ten days. Since the patient has been oriented as to what to expect before and after operation, and has been prepared by increased strength tone and better condition generally; there is less surgical

trauma with operation, less unfavorable reaction, less atrophy and weakness, and much earlier recovery in every way.

After surgery the leg is placed in extension with no immobilization. Care is exercised that no pillow be allowed under the knee, as this would combat the purpose of quadriceps exercises and prolonged knee flexion and weakness would result.

3. *Established Post-Operative Routine*: First through third day: (1) Quadriceps setting—to capacity; usually, first day, 15-25 hourly; second day, 35 hourly; third day, 50 hourly; (2) leg raise—one to three repetitions hourly, and (3) foot exercises—dorsal, plantar flexion, inversion, eversion, circumduction, dorsal flexion with toe grip, 12 repetitions hourly.

On the fourth day, as explained preoperatively to the patient, he leaves his bed, to begin gradual weight bearing, shifting from normal to operative leg, with the knee locked in extension, concentrating on a straight knee. The feet should be comfortably apart, with the toes pointing straight ahead.

Fourth and fifth days: (1) Quadriceps setting—50 times hourly; (2) leg raise—4 to 6 hourly; (3) foot exercises—12 repetitions hourly, and (4) weight balancing without walking—12 times one period daily; graduated weight bearing.

On the sixth day, again as pre-announced, walking begins and gradually increases. Any artificial aid is discouraged, and generally most of the soreness has gone. The value of the indoctrination is seen in the lack of fear in the beginning to walk under instruction after surgery.

Sixth through eighth day: (1) Quadriceps setting—50 times hourly; (2) leg raises—6 to 8 hourly; (3) foot exercises—12 repetitions hourly; (4) weight balancing—24 times, one period daily, graduated weight bearing; (5) walking with weight bearing—length of ward and back twice daily, in addition to bathroom privileges, gradually increasing, and (6) mild flexion and extension of the knee after sutures are out on the seventh day. The day after sutures are out, treatments are scheduled in the Exercise Therapy Clinic.

Eighth through fourteenth day: (1) Quadriceps setting—50 hourly; (2) leg raise—8 hourly, gradually increasing; (3) abduction and adduction—8 repetitions, gradually increased; (4) knee flexion with toe grip—12 repetitions; (5) prone leg raises—8 repetitions, gradually increasing; (6) prone knee flexions—12 repetitions; (7) flexion and extension of knee off treatment table—12 repetitions, heavy resistance, beginning with six pounds, gradually increasing to capacity; (8) walking—gradually increasing, on varied terrain, and (9) hydrogymnastics is an excellent modality for these patients. Buoyancy makes the exercises easier, and at the same time the water provides resistance for strength and encourages exercise through the full range of motion.

This has been called the "Fourteen-Day Treatment Regimen." At the end of that time, many patients are ready for discharge from the hospital. All have learned by valuable experience the place of regular resistance exercises. The patient is familiar with each of the prescribed exercises and their dosage. He is encouraged to continue his treatments at home indefinitely. He is introduced to deep knee bends, which are good quadriceps developers and which can be done at any time and place, starting with 25 and gradually increasing to 100-150 per day.

End Results

For evaluation of results, two important viewpoints have been kept in mind: First, in terms of knee joint functions; second, in effect upon time of hospitalization. The functional results have been classified as good, fair, and poor, with criteria as shown in the following outline.

These criteria can be determined for the most part, as they are objective. Pain and quadriceps strength have enough of the subjective that temperament and individuality may enter into their determination. The second method of evaluation is purely a matter of observation of

GOOD	FAIR	POOR
1. Full extension, 180°	Extension 170°-180°	Less than 130° extension
2. 90° flexion or better	95°-120° flexion	120°-160° flexion
3. "Normal" quadriceps strength	"Fair" quadriceps strength	"Poor" quadriceps strength
4. Ambulation without pain or limp	Ambulation, slight discomfort	Painful ambulation, limp
5. Stable knee joint	Stable knee joint	Unstable knee joint

TABLE 1. — FUNCTIONAL END RESULTS

TYPE OF CASE	No.	Good	%	Fair	%	Poor	%
RUPTURED MENISCI	46	30	65%	15	32.6%	1	2.1%
FRACTURED PATELLA	14	9	64.3%	4	28.5%	1	7.2%
BAKER'S CYST	8	7	87.5%	1	12.5%	0	0
FOREIGN BODY, KNEE	6	6	100%	0	0	0	0
OSTEOCHONDROMA	5	2	40%	3	60%	0	0
LIGAMENT REPAIR	4	3	75%	1	25%	0	0
CHRONIC SYNOVITIS	1	1	100%	0	0	0	0
CHRONIC BURSITIS	1	1	100%	0	0	0	0

TABLE 2. — DAYS OF HOSPITALIZATION AFTER OPERATION

TYPE OF CASE	7-14 DAYS		14-21 DAYS		21-30 DAYS	
MENISCI	19	41.3%	15	32.6%	12	26.3%
PATELLAR FRACTURE	0	0	1	7.2%	13	92.8%
BAKER'S CYST	5	62.3%	2	25%	1	12.5%
FOREIGN BODY, KNEE	3	50%	0	0	3	50%
OSTEOCHONDROMA	2	40%	1	20%	2	40%
LIGAMENT REPAIR	0	0	1	25%	3	75%
CHRONIC SYNOVITIS	1	100%	0	0	0	0
CHRONIC BURSITIS	0	0	1	100%	0	0

hospital records, noting the relative number of days from operation or admission to discharge. By the first method, knee function, 55 cases, or 67.9 per cent were good; 24 cases, or 29.6 per cent were fair; and two cases, 2.5 per cent were poor. By the second method, hospitalization time, 28 cases, or 34 per cent, were discharged between 7 and 14 days; 19 cases, 23 per cent, between 14 and 21 days, and 34 cases, 42 per cent, between 21 and 30 days.

By either of these methods, the values increase when it is considered that these 85 cases include all consecutive surgical knee cases, as seen in the accompanying table, with the respective numbers of ruptured menisci, fractured patellae, Baker's cyst, foreign bodies, osteochondroma, ligament repair, and chronic synovitis, chronic bursitis, in that order of frequency. Of the most frequent, ruptured menisci, 98 per cent showed good to fair results, and 73 per cent were discharged within three weeks of operation. Three of these have returned for further treatment.

Summary

1. Human physiology depends upon stress and strain for normal bodily functions. Interruption is pathologic; disease is the result.

2. Normal body mechanics include many passive elements which are important. The effectiveness of the passive elements depends upon the full and perfect function of the active elements.

3. Time is a major factor in the treatment of all diseases, and an early, or "immediate," energetic program of exercises is the "sine qua non" for early restoration of a strong, fully effective knee, regardless of the pathology.

4. An exactly prescribed graduated system of exercises, beginning immediately after surgery or injury, gives effective benefit to knee cases—both patient and joint—with earlier, more complete, and less painful recovery; and with earlier discharge from hospital care, as outlined in tables 1 and 2. Exercise Therapy has done an excellent job in our hospital in the interpretation and execution of the prescribed program, both before and after operation.

References

1. Ghormley, Ralph K.: Conditions Involving the Knee Joint. Arch. Surg. 57:743 (Nov.) 1948.
2. Cecil and Loeb: Textbook of Medicine, ed. 8, Philadelphia, W. B. Saunders Co., 1951, p. 1345.
3. Smith, Oliver, and Guthrie: Rehabilitation, Re-education and Remedial Exercises, Baltimore, Williams & Wilkins Co., 1945, p. 208.
4. Kraus, Hans: Principles and Practice of Therapeutic Exercise, Springfield, Ill., Charles C Thomas, 1949.
5. De Lorme, T. L.: Restoration of Muscle Power by Heavy Resistance Exercises. J. Bone & Joint Surg. 27:645 (Oct.) 1945.

6. Robertson, T. S., and Hawk, J. M.: Corrective Therapy in the Surgical Knee. The Journal of the Association for Physical and Mental Rehabilitation 6:7 (Sept.-Oct.) 1952.
7. Lipscomb, Paul R., and Henderson, Melvin S.: Internal Derangements of the Knee. J.A.M.A. 135:829 (Nov. 29) 1947.

Discussion

Dr. F. J. Schaffer (Columbia, S.C.): I believe we all agree that the knee is probably the most exposed, the most vulnerable and therefore the most traumatized of the major joints. It is for this reason, too, that a great deal of the physiatrist's time and the time of his physical and exercise therapists is spent in treating pathology at this site. Dr. Dawson is to be congratulated for a paper concerning a joint, which from most of us, receives daily thoughtful attention, and, for making this treatise enlightening and thought provoking. As we all know, most orthopedists still employ the time honored "cast" for post knee surgery immobilization. An active exercise program as outlined here, however, should prove its value in more rapid turnover in hospital beds, speed up functional recovery and result in less loss of time in industry.

The question of early exercise might be raised for several types of knee pathology, however. In spite of reported findings and figures to the contrary, I am inclined to be more conservative as regards exercising the post surgical patella. The same holds true, to a milder degree, in the case of repair of torn ligaments. Having had a "preview" of this paper, I had an opportunity to discuss this problem with several orthopedic surgeons at our hospital. They felt that this exercise program had merit, but balked at the prospect of actively exercising the knee after patella fracture or torn ligament repair. This was not a group decision. These appraisals were gathered on an individual basis. All things considered, however, this paper presents us with another worthwhile contribution in the field of Rehabilitation and I, for one, plan to follow this regimen whenever indicated.

VOLUME XXXIV INDEX FOR JANUARY - DECEMBER, 1953

APPEARS ON PAGES 769 THROUGH 777

Members
Standing Committees of the
American Congress of Physical Medicine and Rehabilitation
1954

Advances in Education
Robert C. Darling, Chairman
Harold Dinken
Earl C. Elkins
Frederic J. Kottke
Donald L. Rose

Awards for Scientific Exhibits
Donald A. Covalt, Chairman
Otto Eisert
A. David Gurewitsch
William H. Northway
Raoul C. Psaki

Balneology and Health Resorts
Hans J. Behrend, Chairman
William Bierman
Kristian G. Hansson
Duane A. Schram
Ferdinand F. Schwartz
Samuel A. Warshaw

Braces, Splints and Prostheses
Robert L. Bennett, Chairman
Arthur S. Abramson
John H. Aldes
Edward E. Gordon
Morton Hoberman
Jessie Wright

Constitution and By-Laws
Fred B. Moor, Chairman
Frances Baker
O. Leonard Huddleston

Cooperation with Air Force, Army, Navy, Public Health and Veterans Administration
Harold B. Luscombe, Chairman
A.B.C. Knudson
Anton A. Tratar

Cooperation with Food and Drug Administration
Ralph E. DeForest, Chairman
Clarence W. Dail
Fritz Friedland
Edward M. Krusen, Jr.
Paul A. Nelson
Charles S. Wise
Harry T. Zankel

Coordination and Integration of Physical Medicine and Rehabilitation in Geriatrics
Michael M. Dacso, Chairman
Nila Kirkpatrick Covalt
Harold Dinken
Karl Harpuder
George M. Piersol

Correlation of Physical Medicine and Psychiatry
Jack Meislin, Chairman
William Bierman
Daniel Dancik
A. Ray Dawson
Everill W. Fowlks
Henry Morelewicz

John S. Coulter Memorial Lecture Fund
Walter M. Solomon, Chairman
Ben L. Boynton
Walter J. Zeiter

Ethics
Arthur L. Watkins, Chairman
John H. Kuitert
Joseph E. Maschmeyer
Jacob L. Rudd
Samuel S. Sverdlik

Finance
Louis B. Newman
Walter M. Solomon
Charles S. Wise

Foster, Encourage and Coordinate Research Projects
Robert W. Boyle, Chairman
Murray B. Ferderber
Frances A. Hellebrandt
Louis B. Newman
William D. Paul
Wilbur A. Selle

Gold Key Awards
Howard A. Rusk, Chairman
Arthur C. Jones
A.B.C. Knudson
Gordon Martin
Donald L. Rose

Legislation
Frederic J. Kottke, Chairman
Herman L. Rudolph
Bror S. Troedsson

Medical Auxiliary Services Related to Physical Medicine and Rehabilitation
Jessie Wright, Chairman
John C. Allen
Herman J. Bearzy
A. Ray Dawson
Bruce B. Grynbaum
Sedgwick Mead

Medical Economics
H. Worley Kendell, Chairman
Isadore Levin
Edward J. Lorenze

Meeting Place
Walter J. Zeiter, Chairman
Everill W. Fowlks
Herbert W. Park
James W. Rae, Jr.
Edward B. Shires

Membership
Max K. Newman, Chairman
Elizabeth Austin
Harriet E. Gillette
Thomas F. Hines
Samuel Sherman

Nominating
George M. Piersol, Chairman
Kristian G. Hansson
Fred B. Moor
Walter M. Solomon
Arthur L. Watkins

Prize Lecture
William D. Paul, Chairman
O. Leonard Huddleston
Frederic T. Jung
Walter S. McClellan

Program
Walter M. Solomon, Chairman
Arthur L. Watkins
Walter J. Zeiter

Public Relations
Frank H. Krusen, Chairman
Robert L. Bennett
Howard A. Rusk

Rehabilitation Centers
Arthur C. Jones, Chairman
Herman J. Bearzy
Nila Kirkpatrick Covalt
George G. Deaver
Walter J. Lee
Ralph E. Worden

EDITORIALS

ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION
OFFICIAL JOURNAL

American Congress of Physical Medicine and Rehabilitation
American Society of Physical Medicine and Rehabilitation

32nd Annual
Scientific and Clinical Session

What paper presented at the last annual session in Chicago was most worthwhile? What paper created the most interest? Should more papers dealing with the basic sciences be given? Is the number of papers on the clinical application of Physical Medicine and Rehabilitation sufficient? The Program Committee would like your help and advice on the program for the next annual meeting scheduled for September 6-11, 1954, at Washington, D. C.

In January, 1954, each Congress member will be sent a questionnaire relative to the presentation of papers. It is hoped that many more papers will be offered for the coming meeting than in the past. A large number of requests to present papers will enable the committee to make a better selection for the scientific program.

The present plan is to have symposia on ultrasonics, geriatrics, hydrotherapy, poliomyelitis, exercises, arthritis and other subjects. Do you have any preference for panel discussions; presentation of patients; special demonstrations of apparatus and technics of application? Are there any other new or unusual ideas that would add to the scientific value of the meeting? Perhaps you are acquainted with the endeavors of investigators or clinicians who are not Congress members, but whose work would interest our audiences. Inform the Program Committee of their names and subjects and they will be invited to read papers.

May we, the Program Committee, ask that you give serious thought to the coming meeting. Any comments or suggestions you may have should be sent to us. We look forward to receiving an unprecedented number of requests to present and discuss papers, as well as applications for scientific exhibit space. Your cooperation augurs well for a highly successful meeting in our nation's capitol next year.

PROGRAM COMMITTEE

Walter M. Solomon, Chairman
1032 B.F. Keith Bldg.
Cleveland 15, Ohio

Arthur L. Watkins
Massachusetts General Hospital
Boston 14, Mass.

Walter J. Zeiter
Cleveland Clinic Foundation
2020 E. 93rd St.
Cleveland 6, Ohio

A NOTE FROM THE PRESIDENT—
On Membership

Wm. Benham Snow

The objects of the American Congress of Physical Medicine and Rehabilitation are to promote and advance the art and science of Physical Medicine and Rehabilitation. The Congress serves as a medium for dissemination of education in this special field and gives overall guidance in all areas of physical medicine and rehabilitation practice.

Not all Congress members are specialists in Physical Medicine and Rehabilitation; rather they are students of these subjects, seeking to become better informed of the application of the specialty in their own practice. An association of this sort is a particularly valuable one to the medical profession because Physical Medicine and Rehabilitation in its application crosses the lines of so many of the other special fields of medical practice. Physical Medicine and Rehabilitation is a treatment adjunct to each of these.

The American Congress of Physical Medicine and Rehabilitation is a democratic society in which *melting pot* medical men meet to exchange views and rationalize the use of these special methods in treatment. The standing committees of the Congress, by hard work and loyalty of the membership over the years, have brought the prestige of the association to its present stature. Their efforts have resulted in the development of such groups as the American Registry of Physical Therapists; American Society of Physical Medicine and Rehabilitation; American Board of Physical Medicine and Rehabilitation, and the Section on Physical Medicine and Rehabilitation of the American Medical Association.

The ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION has amalgamated with various other periodicals devoted to physical medicine and as the official journal of the Congress and the Society, is the medium of dissemination of all that is new in the field to its members and to the medical profession at large.

Membership in the American Congress of Physical Medicine and Rehabilitation offers unequalled dividends to those who would know more of physical medicine application in rehabilitation of patients whose recovery may be enhanced by carefully applied technics. The Congress membership is woefully small for the important utilitarian position it occupies in the medical field. More time is now devoted to the treatment of chronic illness, severe physical disabilities as found in neurological diseases, post-traumatic conditions, psychiatry and in the aging. A physician must make available what is the best in Physical Medicine and Rehabilitation to care properly for such patients.

The membership has a duty to the practicing physician to increase his awareness of this important facet of his practice. Increase in the membership will give added impetus to the work of the Congress. With the present growth of interest and application, this is the time for the group to surge its membership.

The Membership Committee is starting a drive for new members. This committee, five in number, will give leadership in the drive, but success will depend on the combined efforts of the entire membership as individuals and as members of their sectional and local societies. The Editorial Board of the ARCHIVES will do much to help in this effort. Elsewhere in this issue a membership application blank appears. This application, at the request of the Membership Committee, will be printed monthly. However, new members will come largely through the personal efforts of present members in their daily medical contacts. May I suggest that whenever and wherever a conclave assembles to discuss problems in Physical Medicine and Rehabilitation whether it be at a State Society meeting, sectional meeting, local society meeting, hospital staff meeting or the Section on Physical Medicine and Rehabilitation of the American Medical Association, that every Congress member attending these functions bring along at least one guest. If interest in our group is shown by this individual, send his name and address to the Membership Committee and perhaps they, with your local help, can excite sufficient interest for this person to become a member. All others whom you know have an interest in this specialty should be referred to the Membership Committee.

It is out of the general Congress membership that specialists in our field are bred. Men schooled in Physical Medicine and Rehabilitation are needed to carry out programs already under way in hospitals, recreation centers, medical centers, cerebral palsy centers, and others.

Every practicing physician is a potential member of the Congress. *Get him in!*

Wm Bruce Snow

GOLD KEY AWARDS

Dr. Howard A. Rusk, Chairman of the Gold Key Awards Committee, has announced that the closing date for nominations for 1954 Gold Key Awards is March 15, 1954.

Congress members wishing to nominate an individual whose accomplishments in the field of Physical Medicine and Rehabilitation have been outstanding in nature and have resulted in raising the discipline of the specialty to a higher standard can forward their nominations to Dr. Rusk, Institute of Physical Medicine and Rehabilitation, 400 East 34th Street, New York 16, or to other members of the Committee:

ARTHUR C. JONES, M.D.
419 Mayer Building
Portland 5, Oregon

A.B.C. KNUDSON, M.D., Chief
Physical Medicine and
Rehabilitation
Veterans Administration
Department of Medicine
and Surgery
Washington 25, D. C.

GORDON MARTIN, M.D.
Section on Physical Medicine
and Rehabilitation
Mayo Clinic
Rochester, Minnesota

DONALD L. ROSE, M.D.
Dept. of Physical Medicine
Univ. of Kansas School of Medicine
39th and Rainbow Boulevard
Kansas City 3, Kansas

Recommendations should include the name and address of the candidate, his accomplishments in the field of Physical Medicine and Rehabilitation, and a statement indicating how his accomplishments have resulted in raising the discipline of the specialty to a higher standard.

MEDICAL NEWS

Members are invited to send to this office items of news of general interest, for example, those relating to society activities, new hospitals, education, etc. Programs should be received at least six weeks before the date of meeting.

DR. F. KRUSEN NAMED FOR NATIONAL PHYSICIAN'S AWARD

Dr. Frank Hammond Krusen, Rochester, Minnesota, has been named to receive the second annual Physician's Award by The President's Committee on Employment of Physically Handicapped, Vice Adm. Ross T. McIntire, (MC) USN, Ret., Chairman, announced.

Dr. Krusen was the unanimous nominee of the Minnesota Governor's Advisory Committee on Employment for Physically Handicapped Persons and was selected for his work in teaching physical medicine to other doctors. A part of his pioneering work in this field was his contribution to the development and construction of a new Rehabilitation Center at the University of Minnesota. When completed, this center will assure continuous post graduate training in physical medicine and rehabilitation.

Dr. Krusen's career of public service includes his chairmanship in 1944 of the Baruch Committee on War and Post-War Physical Rehabilitation. He is past president of the American Congress of Physical Medicine and Rehabilitation, and has been Councilor of the National Society for Crippled Children and Adults since 1947. He also serves on the Advisory Board of the Minnesota Rehabilitation Association and is the author of many widely circulated books and articles in the field of physical medicine.

In the citation accompanying his nomination by the Minnesota Advisory Committee, Governor C. Elmer Anderson said in part: "Minnesota is nominating Dr. Krusen as the nation's foremost physician in the field of employability of the physically handicapped. We in this State believe that a physically handicapped person is not fully rehabilitated until, if humanly possible, he has a regular job that utilizes his remaining abilities so that he can live individually as a part of our economy rather than be dependent on it."

The award will be presented by Adm. McIntire during the annual meeting of the Congress on Industrial Health at Louisville, Kentucky, February 23-24, 1954.

PERSONALS

Herman J. Bearzy, Dayton, Ohio, discussed "Your Child and Polio" at a meeting of the Miami County Chapter of the National Foundation for Infantile Paralysis, Inc., November 16; at the same meeting, **Kenneth W. Keever,** Magnetic Springs, Ohio, explained his rehabilitation hospital plan for Magnetic Springs.—**Joseph Benton,** New York City, spoke on "Occupational Rehabilitation of the Cardiac; Recent Advances in Methods of Evaluation" at the NRA Annual Conference at Miami Beach, Florida; also represented at this meeting were **A. Ray Dawson,** Richmond, Va., who discussed "Rehabilitation Centers"; **Nila Kirkpatrick Covalt,** Rocky Hill Conn., who discussed "The Role and Function of the Community Rehabilitation Center," and **Ralph Worden,** Columbus, Ohio, who acted as discussant.—**Ben L. Boynton,** Chicago, has been recently named Medical Director of the Rehabilitation Institute of Chicago and Professor of Physical Medicine and Rehabilitation at the Northwestern University Medical School.—The University of Louisville School of Medicine announced that **Donald A. Covalt,** New York City, has been named consultant to the Department of Physical Medicine and Rehabilitation, and to the Rehabilitation Center.—At the State Medical Meeting in Roanoke, Va., **A. Ray Dawson,** Richmond, Va., acted as moderator of a panel discussion on general problems of rehabilitation.—**S. Malvern Dorinson,** San Francisco, Calif., attended the Pacific Coast Regional Conference of the United Cerebral Palsy Associations held in Seattle, Wash., on September 19 and 20; on September 29, he participated in a panel on rehabilitation evaluation conducted as part of a Rehabilitation Institute sponsored by the Chronic Illness Service of San Francisco; Dr. Dorinson also spoke on "Rehabilitation. A Job for the Physician" at the State Convention of the California Society of Crippled Children held in San Diego on October 31.—**Samuel G. Feuer,** Brooklyn, N.Y., has been recently appointed chief of Physical Medicine and Rehabilitation at the Brooklyn Regional Office of the Veterans Administration.

Gustave Gingras, Montreal, visited Venezuela in September as a United Nations consultant to assist in the development of rehabilitation services.—**Joseph Lee Hollander**, Philadelphia, spoke at a postgraduate teaching day on arthritis and rheumatism conducted at the Rochester (New York) Academy of Medicine. His topic was "Present-Day Treatment of Chronic Arthritis."—At a monthly staff meeting of the Kabat-Kaiser Institute, **O. Leonard Huddleston**, Santa Monica, Calif., spoke on "Use of Speech Therapy in Physical Medicine"; Dr. Huddleston also presented this same topic at the monthly staff meeting of the National Rehabilitation Association of Southern California.—**Herman Kabat**, Vallejo, Calif., participated in an Institute on Physical Medicine for Occupational Therapists and Physical Therapists; Dr. Kabat is also serving on the Medical Advisory Committee of the American Federation of the Physically Handicapped.—**Miland E. Knapp**, Minneapolis, Minn., was one of the guest instructors at the Postgraduate Courses in Orthopedics, Physical Medicine and Rehabilitation sponsored by the University of Kansas School of Medicine.

At its annual meeting the Medical Society of the County of New York presented one of its first distinguished service citations to **Madge C. L. McGuinness** of New York City.—**Christopher J. McLoughlin**, Atlanta, Ga., participated in a panel discussion at the Medical Public Relations Institute held in Chicago on September 2 and 3.—**Louis B. Newman**, Chicago, addressed the 4th Annual Scientific and Clinical Conference of the American Association of Rehabilitation Therapists on September 9; his topic was "Medicine as a Basic Working Tool for the Therapist." Dr. Newman has recently been appointed Chief of the Physical Medicine and Rehabilitation Service at the new 520-bed Veterans Administration Research Hospital, 333 E. Huron St., Chicago. Prior to this appointment, he was Chief of Physical Medicine and Rehabilitation at the Hines VA Hospital since March, 1946.—**Max K. Newman**, Detroit, Mich., is one of the vice-presidents of the American Federation of the Physically Handicapped.—**William D. Paul**, Iowa City, Iowa, was one of the guest instructors at the Postgraduate Courses in Orthopedics, Physical Medicine and Rehabilitation sponsored by the University of Kansas School of Medicine.—**Howard A. Rusk**, New York City, participated in an Institute on Physical Medicine for Occupational Therapists and Physical Therapists; Dr. Rusk has been recently designated a member of the ISWC Assembly as one of the representatives of the United States.—**Ferdinand F. Schwartz**, Birmingham, Ala., addressed the Marion County Medical Society at Winfield, Ala., on October 1. His topic was "Physical Medicine in Everyday Practice." Dr. Schwartz attended the International Congress on Pediatrics at Havana, Cuba, and spoke on "Physical Medicine in Cerebral Palsy"; "Physical Medicine and Rehabilitation" was the subject matter presented by him at a meeting of railroad surgeons in Birmingham on October 30.—**Jose I. Tarafa**, Havana, Cuba, ISWC Vice-President, visited Venezuela, Uruguay, Argentina, Chile and Peru following participation in the Second Congress of the Latin American Society of Orthopedics and Traumatology in Brazil last July.—**Jean J. Vivino**, Washington, D.C., is serving on the Medical Advisory Committee of the American Federation of the Physically Handicapped.—**Charles S. Wise**, Washington, D.C., discussed the rehabilitation problem at the meeting of the Medical Society of Virginia.—**Leonard J. Yamshon**, Los Angeles, Calif., presented the topic "Industrial Aspects of Physical Medicine and Its Problems" at a monthly staff meeting of the Kabat-Kaiser Institute at Santa Monica, Calif., on November 3.—**Harry T. Zankel**, Cleveland, Ohio, has been recently appointed as Consultant in Physical Medicine and Rehabilitation to the Veterans Administration Hospital at Erie, Pa. Dr. Zankel will visit the hospital twice monthly to see patients and to lecture to the hospital staff on physical medicine and rehabilitation subjects.

SCHOLARSHIP FUND ESTABLISHED

A scholarship fund of $1,000 for physical therapy students has been set up at the University of Connecticut by the Connecticut Society for Crippled Children and Adults.

The fund will be known as the Easter Seal Scholarship Fund and will be used to further interest and education in physical therapy. The scholarships will be distributed through the University Scholarship Committee, to be awarded to either entering students or upper class students eligible for such scholarships.

SIXTH ANNUAL RADIATION THERAPY NUMBER

The November issue of the MISSISSIPPI VALLEY MEDICAL JOURNAL & RADIOLOGIC REVIEW (Quincy, Ill.) is entirely devoted to Radiation Therapy. This is an annual feature and the special number this year contains 18 original articles, especially written to appeal to physicians in general practice being designed to arouse in the general profession a greater appreciation of the accomplishments of radiation therapy. The papers are well written and should be of interest to those who are desirous of keeping up with the progress of therapeutics.

AEC OFFERS EIGHT FELLOWSHIPS IN INDUSTRIAL MEDICINE

Eight fellowships in industrial medicine will be offered by the U.S. Atomic Energy

Commission for the 1954-1955 academic year. The fellowship program, begun by the AEC four years ago, is designed to provide advanced training and on-the-job experience for men and women physicians in the field of industrial medicine, particularly in relation to the atomic energy industry.

The fellowships are open to United States citizens who hold M.D. degrees from approved medical schools, and who have had at least one year of internship. In exceptional cases, equivalent experience may be accepted in lieu of the internship requirement. Successful candidates must be investigated by the FBI and approved by the AEC before receiving fellowships.

Awards are for one year's academic training at institutions offering approved graduate courses in industrial medicine which can provide special training facilities in the health problems associated with the atomic energy program. Normally, fellows will be eligible for a second, or in-plant, training year upon successful completion of the academic year. In-plant training will be given in medical departments of major AEC plants and laboratories.

The stipend during the first year is $3,600, with $350 additional for a wife and for each dependent child. Tuition and laboratory fees will be paid. The stipend for the second year is $6,000, with no additional amounts for a wife or children.

The program is administered for the AEC by the Atomic Energy Project of the School of Medicine and Dentistry, University of Rochester, Rochester, New York. Fellows are selected by a committee headed by Dr. Robert A. Kehoe, Director, Institute of Industrial Health, University of Cincinnati, and Medical Director, Ethyl Corporation.

Applications for 1954-55 fellowships should be submitted by January 1, 1954 to: AEC Fellowships in Industrial Medicine, Atomic Energy Project, University of Rochester, School of Medicine and Dentistry, Rochester, New York; Attention: Dr. Henry A. Blair.

SIXTH WORLD CONGRESS

The Sixth World Congress of the International Society for the Welfare of Cripples is scheduled for September 13 to 17, 1954, The Hague, Netherlands. This meeting is to be held in cooperation with the Netherlands Central Society for the Welfare of Cripples.

The professional and technical program of the conference will include subjects related to the organization of services for the crippled, an international view of rehabilitation services and other matters of interest to doctors, therapists, social workers, nurses, teachers, administrators and others concerned with the problems of physical disability.

Further information may be secured from International Society for the Welfare of Cripples, 127 E. 52nd St., New York 22, N.Y., or Congress Bureau, Sixth World Congress—ISWC, Pieter Lastmankade 37, Amsterdam-Zuid, Netherlands.

THALASSOTHERAPY MEETING

At a meeting scheduled from May 8 to May 15, 1954, Yugoslavia, the following subjects will be discussed: thalassotherapy; medical hydro-climatology; and, social, economic, technical and juridicial questions in connection with hydro-climatology. Complete details on this meeting may be had by writing Prof. Cedomil Plavsic, Beograd, Yugoslavia, Zeleni venac 1.

APPARATUS ACCEPTED

The following information relative to apparatus accepted by the Council on Physical Medicine and Rehabilitation of The American Medical Association is reprinted, with permission, from the November 14, 1953 issue of The Journal of The American Medical Association.

Fortiphone Hearing Aid, Model 20 A: Fortiphone Ltd., Fortiphone House, 247 Regent St., London, England, 1, W. Distributor: Anton Heilman, 75 Madison Ave., New York 16.

The Fortiphone Hearing Aid, Model 20 A, uses three English-made vacuum tubes for amplification and is powered by a 1.5 volt Vidor A-battery and a 22.5 volt Siemax B-battery. It is capable of giving a higher acoustic gain than is the Fortiphone Hearing Aid, Model 21 C, but also has an automatic volume control, referred to as the AVC, which limits the maximum output of the instrument and prevents the intensity of sound from reaching the user's threshold of pain.

The body of the instrument measures 98 by 60 by 23 mm. and weighs 117.7 gm. The added weight of batteries, earphone, and earphone cord make a total of 180.5 gm.

The Council obtained evidence that this device was soundly constructed and performed as claimed by the manufacturer.

Fortiphone Hearing Aid, Model 21 C: Fortiphone Ltd., Fortiphone House, 247 Regent St., London, England, 1, W. Distributor: Anton Heilman, 75 Madison Ave., New York 16.

The Fortiphone Hearing Aid, Model 21 C, uses three English-made vacuum tubes for amplification and is powered by a 1.5 volt Vidor A-battery and a 22.5 volt Siemax B-battery. The body of the instrument measures 98 by 60 by 23 mm. and weighs 119 gm. With batteries, earphone, and earphone cord the total weight is 175 gm. Earphones are supplied for air and bone conduction.

Evidence of satisfactory construction and performance was obtained by the Council.

BOOKS RECEIVED

Books received are acknowledged in this column as full return for the courtesy of the senders. Reviews will be published in future issues of the journal. Books listed are not available for lending.

AMERICAN ACADEMY OF ORTHOPAEDIC SURGEONS INSTRUCTIONAL COURSE LECTURES. VOLUME X. by Charles N. Pease; J. W. Edwards, Ann Arbor, Mich.

THE BASIS OF CLINICAL NEUROLOGY (THIRD EDITION) by Samuel Brock; The Williams & Wilkins Co., Baltimore, Md.

WATER, ELECTROLYTE AND ACID-BASE BALANCE by Harry F. Weisberg; The Williams & Wilkins Co., Baltimore, Md.

PRACTICAL PHYSICAL THERAPY (FIFTH EDITION) by Joseph E. G. Waddington; J. E. G. Waddington, Detroit, Mich.

THE AUTONOMIC NERVOUS SYSTEM by Albert Kuntz; Lea & Febiger, Philadelphia, Pa.

NERVOUS TRANSMISSION by Ichiji Tasaki; Charles C Thomas, Springfield, Ill.

STRESS AND DISEASE by Harold G. Wolff; Charles C Thomas, Springfield, Ill.

ON BURNS edited by Nathan A. Womack; Charles C Thomas, Springfield, Ill.

YOUR ARTHRITIS: WHAT YOU CAN DO ABOUT IT by Alfred E. Phelps; William Morrow & Co., Inc., New York, N.Y.

THE WECHSLER-BELLEVUE SCALES: A GUIDE FOR COUNSELORS by C. H. Patterson; Charles C Thomas, Springfield, Ill.

PHYSIOLOGICAL AND THERAPEUTIC EFFECTS OF CORTICOTROPIN (ACTH) AND CORTISONE by Dwight J. Ingle and Burton L. Baker; Charles C Thomas, Springfield, Ill.

CLINICAL APPLICATIONS OF SUGGESTION AND HYPNOSIS by William T. Heron; Charles C Thomas, Springfield, Ill.

THE FOUNDERS OF NEUROLOGY: 133 BIOGRAPHICAL SKETCHES edited by Webb Haymaker; Charles C Thomas, Springfield, Ill.

NEUVAS REVELACIONES SOBRE EL CUERPO HUMANO Y LA VOZ by Agustin Godoy; La Editorial Vizcaina, South America Bilbao.

CALDERWOOD'S ORTHOPEDIC NURSING (THIRD EDITION) by Carroll B. Larson and Marjorie Gould; The C. V. Mosby Co., St. Louis, Mo.

PERIPHERAL NERVE INJURIES (SECOND EDITION) by Webb Haymaker and Barnes Woodhall; W. B. Saunders Co., Philadelphia, Pa.

WHAT'S YOUR PROBLEM by Alfred Blazer; The Citadel Press, New York, N.Y.

PARKINSON'S DISEASE AND ITS SURGICAL TREATMENT by Leslie C. Oliver; H. K. Lewis & Co., Ltd., London, England.

PHYSIOLOGY OF MUSCULAR ACTIVITY (FOURTH EDITION) by Peter V. Karpovich; W. B. Saunders Co., Philadelphia, Pa.

GROUP WORK WITH THE AGED by Susan H. Kubie and Gertrude Landau; International Universities Press, Inc., New York, N.Y.

PATIENTS ARE PEOPLE: A MEDICAL-SOCIAL APPROACH TO PROLONGED ILLNESS by Minna Field; Columbia University Press, New York, N.Y.

EXPERIMENTAL ATHEROSCLEROSIS by Louis N. Katz and Jeremiah Stamler; Charles C Thomas, Springfield, Ill.

MAN'S BACK by Theodore A. Willis; Charles C Thomas, Springfield, Ill.

DISEASES OF THE LIVER, GALL-BLADDER AND BILE DUCTS. VOLUMES I AND II (THIRD EDITION) by S. S. Lichtman; Lea & Febiger, Philadelphia, Pa.

DISEASES OF WOMEN by Robert James Crossen; The C. V. Mosby Co., St. Louis, Mo.

HYPERTENSIVE DISEASES: CAUSES AND CONTROL by Henry A. Schroeder; Lea & Febiger, Philadelphia, Pa.

REHABILITATION PIONEER HONORED

The work of the late Colonel John N. Smith, Jr., pioneer in rehabilitation of the physically handicapped and Director of the Institute for the Crippled and Disabled in New York City, from 1933 to 1953, was commemorated with the unveiling of a bronze memorial tablet presented to the Institute by the Executive Committee of President Eisenhower's Committee on Employment of the Handicapped.

Colonel Smith, who was a member of this Committee, as well as chairman of the U. S. Department of Labor's National Advisory Committee on Sheltered Workshops, died in June of this year after a brief illness. His relentless devotion to the treatment of the handicapped and the conduct of research and teaching activities in this field were recalled by Mr. Jeremiah Milbank, philanthropist and founder of the Institute. "No man has made a greater contribution in the field of rehabilitation than Colonel Smith," Mr. Milbank said. "The broad and fundamental concepts which Colonel Smith advanced will continue to be regarded as the basis of modern complete rehabilitation."

RECENT PUBLICATIONS BY MEMBERS

Anthony C. Bassler, "Etiology of Cardiac Thrombosis: Can it be bound up with the inhalation of the gasoline combustion products?" Medical Times, October, 1953.

Donald A. Covalt, "Aids to Ambulation." American Journal of Nursing, September, 1953.

Donald A. Covalt, "Physical Medicine and

Rehabilitation in Home Care Programs." New York State Journal of Medicine, July 15, 1953.

Harry M. Hines, with co-authors, "Effect of Procaine Administration upon Blood Flow in Normal and Denervated Limbs of Dogs." American Journal of Physical Medicine, October, 1953.

Herman Kabat, with co-author, "Proprioceptive Facilitation of Voluntary Motion in Man." Journal of Nervous and Mental Disease, March, 1953.

S. M. Kelly, with co-author, "Program of Kinetic Occupational Therapy for Pulmonary Surgical Cases." Department of Medicine and Surgery Information Bulletin, October, 1953.

A.B.C. Knudson, "Reduction of Tubs and Packs through Activity Programs in the Veterans Administration." Department of Medicine and Surgery Information Bulletin, October, 1953.

John H. Kuitert and Frederick E. Vultee, "Permanent Total Blindness Associated with Severe Physical Disability Including Bilateral Amputation of the Hands." American Journal of Physical Medicine, October, 1953.

Joseph Martella, "Preliminary Report of Followup Survey of Patients Discharged Maximum Hospital Benefit." Department of Medicine and Surgery Information Bulletin, October, 1953.

Sedgwick Mead, with co-authors, "Skin Impedance in Relation to Pain Threshold Testing by Electrical Means." Journal of Applied Physiology, June, 1953.

Howard A. Rusk, with co-authors, "The Work Week of Physicians in Private Practice." The New England Journal of Medicine, October 22, 1953.

Howard A. Rusk, with co-author, "Decubitus Ulcers Treated with Dried Blood Plasma." The Journal of The American Medical Association, October 31, 1953.

Frank H. Schaffer, "Aid in Determining Proper Lift for Extension Shoes." Department of Medicine and Surgery Information Bulletin, October, 1953.

E. M. Throne, W. H. Moore and R. C. Psaki, "Muscular Viability in Peripheral Nerve Injuries." U. S. Armed Forces Medical Journal, July, 1953.

NEWLY REGISTERED THERAPISTS

October 29, 1953

Andrews, Beverly Jane, Rt. 2, Box 523-B, Albuquerque, N. Mex.

Barnhart, Anna Louise, 714 Brookwood Rd., Baltimore 29, Md.

Bodine, Martha, 700 Highland Terr., Williamsport, Pa.

Clinkingbeard, James R., 610 Stephens Ave., Missoula, Mont.

Davis, Samuel, 522 S. Park St., Elizabeth, N. J.

Day, Joseph Stanton, 161 Main St., Souderton, Pa.

Evans, Daniel Richard, 6926 S. Jeffery Ave., Chicago 49, Ill.

Fearnside, Patricia, 22462 Statler Blvd., St. Clair Shores, Mich.

Gustad, Roberta Lorraine, 918 S. 5th East, Salt Lake City, Utah.

Hanson, Verdeen, 1973 Yale Ave., Salt Lake City, Utah.

Hatton, Woodford E., 549 E. 7th St., Lexington, Ky.

Hopkins, Amanda Elizabeth, Flanders Height, Swainsboro, Ga.

Hughes, Paul Gilbert, 2509 N. W. Lovejoy, Portland, Ore.

Jimenez, Jose Angel, 1144 Spruce St., Chester, Pa.

Jones, Elizabeth Anne, 7 Fitz Rd., Peabody, Mass.

Kiefer, Manley Charles, 1445 Monroe St., Denver 6, Colo.

King, William Joseph, 639 Merchant St., Coatesville, Pa.

Leahy, Barbara Ann, 418 3rd Ave. S. W., Rochester, Minn.

Lewis, Mary Emma, Lorraine Hotel, Broad and Fairmont Ave., Philadelphia 23, Pa.

Luckman, Joe Oliver, c/o I. E. Peterson, Rt. 2, Missoula, Mont.

Moore, Marjorie Cunningham, 5 Forbes Ave., Elm Grove, Wheeling, W. Va.

Morris, Harold Stewart, RR 1, Harmon, Ill.

Paisley, Alvin Dean, RD 1, West Grove, West Grove, Pa.

Perkins, Mary Lynn, 3522 W. Kenyon St., Seattle, Wash.

Peth, Lillian Mae, c/o W. J. Runyon, Collbran, Colo.

Robenstein, Margaret Jane, 439 Harrison St., Loveland, Colo.

Robins, Robert R., 335 W. Golden, Cripple Creek, Colo.

Rosado, Orpha, Box 2082, U P.R., Rio Piedras, P.R.

Rumney, John Raymond, 236 Grandview Ave., Pitman, N.J.

Salvanelli, Mario Lewis, 8600 Leonard Dr., Silver Spring, Md.

Sanabria, Ana Teresa, Victoria 30, San German, P.R.

Sippel, John Alexander, Jr., 936 W. Second St., Hazleton, Pa.

Spangenberg, Gwendolyn, Box 23, Fallsington, Pa.

Stepanavage, Alphonse Michael, 339 W. Mahoney St., Mahoney City, Pa.

Thurman, Barbara Fay, 24 N. Pauline St., Memphis, Tenn.

Townsend, Marion Louise, 3 Hampilton Lane, Valdosta, Ga.

Weber, Margaret Claire, Belle Fourche, S. D.

November 3, 1953

Crummey, Joan, 14 Marinello Terr., Albany 9, N. Y.

Goddard, Elizabeth Anne, 45 Ellsworth St., East Hartford 8, Conn.

November 10, 1953

Holmes, Marion Louise, Box 86, New Woodstock, N.Y.

Jacobus, Herbert J., 1339 Bedford Ave., Brooklyn 16, N.Y.

Low, Jean Wade, 116 Western Ave., East Lynn, Mass.

Melniker, Nathan, 258 Wadsworth Ave., New York 33, N.Y.

Riess, Louis C., 118 Riverside Ave., Prospect Park, Pa.

Sekiya, Walter S., 3004 Libert St., Honolulu, T. H.

November 13, 1953

Bretton, Dana Phyllis, 225 Glenn Ave., Ellwood City, Pa.

Curcio, Norma Dorothy, Box 76, Newell, Pa.

Downing, Suzanne Elizabeth, 700 California Ave., Pittsburgh 2, Pa.

Ellis, Alice Catherine, 801 Van Kirk St., Clairton, Pa.

Estermyer, Shirley Ann, 2210 Seventh Ave., Beaver Falls, Pa.

Helpy, Peter Joseph, 120 Center Ave., Pitcairn, Pa.

Higley, Delilah May, 14805 Fox St., San Fernando, Calif.

Koplovitz, Betty Georgia, 118 E. Third St., Lewistown, Pa.

Lange, D. Wilma, 632 Broad Ave., Belle Vernon, Pa.

Mansberger, Lois Marie, 6 Gay St., Winchester, Ky.

Monaco, Frederick Anthony, 895 North St., New Kensington, Pa.

Myers, Barbara Wolfson, 832 Thorn St., Sewickley, Pa.

Parks, Helen Young, 530 Wood St., Johnstown, Pa.

Pascasio, Anne, 436 Bower Hill Rd., Pittsburgh 28, Pa.

Prasek, Helen Martha, 1099 Ray Rd., Ambridge, Pa.

Rocafort, Giovanna, Las Coabas 209, Hyde Park, Rio Piedras, P.R.

Rougraff, Henriette Emilie, 319 Bank St., Sewickley, Pa.

Soliday, Harry Leslie, 819 E. Maple, Enid, Okla.

Thompson, Florence Merrie, 51 Lincoln Ave., Pittsburgh 2, Pa.

November 19, 1953

Ball, Marjorie Anne, 15 Thayer St., Brookline 46, Mass.

Barnhart, Barbara Anne, 1440 Willard St., San Francisco 17, Calif.

Baumgarth, LeRoy Otto, 1735 S. New Hampshire, Los Angeles 6, Calif.

Brodie, William Roberts, 3039 Shrine Pl., Los Angeles 7, Calif.

Calhoon, Jean Esther, 1718 W. 79th St., Los Angeles 47, Calif.

Carston, Dollie Carmin, Rt. 1, Box 938, Delano, Calif.

Craft, Rose Marie, 10221 E. Main Ave., Opportunity, Wash.

Cwik, Caroline A., Box 471, Rancho Santa Fe, Calif.

Diamandidou, Eleni, Trapezountos 11, Thessaloniki, Greece.

Eckert, Wade R., 6500 Riverton Ave., North Hollywood, Calif.

Flaugher, Donna Deane, 2410 E. 11th St., Bremerton, Wash.

Freitas, Janice Marie, 1720 Grand Ave., San Rafael, Calif.

Gesch, George William, 171 S. Center, Orange, Calif.

Guthridge, Frank William, 352 E. Main St., Norristown, Pa.

Kaplan, Robert Irving, 824 E. University Ave., Burbank, Calif.

Leavitt, Gwen Louise, 3254 Knowland Ave., Oakland 19, Calif.

Ludemann, Elizabeth Louise, 777 17th Ave., San Francisco, Calif.

Margerum, Herbert A., 1855 E. Mountain St., Pasadena, Calif.

Morris, Charles Lawrence, 744 W. 27th St., Los Angeles, Calif.

Morris, David Harold, 313 S. Rampart Blvd., Los Angeles 57, Calif.

Ng, Sun Wah, 1068 Clay St., San Francisco, Calif.

Royal, Mary Ann, 1495 7th Ave., San Francisco, Calif.

Schneider, Shirley Ann, 328 W. Amerige Ave., Fullerton, Calif.

Schuetrum, Walter John, 2022 McAllister St., San Francisco 18, Calif.

Shanklin, Ellanor Porter, 203 Sedgwick Dr., Syracuse, N.Y.

BOOK REVIEWS

The reviews here published have been prepared by competent authorities and do not necessarily represent the opinions of the American Congress of Physical Medicine and Rehabilitation and/or the American Society of Physical Medicine and Rehabilitation.

COMROE'S ARTHRITIS AND ALLIED CONDITIONS. Revised and edited by *Joseph Lee Hollander*, A.B., M.D., F.A.C.P., Associate Professor of Medicine and Chief of Division of Rheumatology, Graduate School of Medicine; Associate Professor of Clinical Medicine, School of Medicine, University of Pennsylvania; Chief of Arthritis Section, University Hospital; Chief of Rheumatology Department, Graduate Hospital, University of Pennsylvania, and collaborating editors. Fifth edition. Cloth. Price, $16.00. Pp. 1103, with 399 illustrations. Lea & Febiger, Washington Square, Philadelphia 6, 1953.

This is the type of book for which a review could be summed up in one statement, namely—this is the best, the most up to date, the most informative, the easiest to use, the most complete work of its kind. Anyone who needs a book about the rheumatic diseases, will find that this work is as near perfect as any can be. The busy practitioner, and any others will find the box form summaries a unique and ready reference feature which alone would justify the book. The specialist in rheumatology will find all the worthwhile information and references that he could possibly use. Other specialists, whether physiatrist, orthopedist, internist, or dermatologist will find this one volume their best source of knowledge.

The writer had the privilege of reviewing the fourth edition which appeared in 1949. This was the first edition brought out after the death of Dr. Comroe and was edited by Dr. Hollander with the help of outstanding collaborators. As good as the original edition of Dr. Comroe was, this new effort is a vast improvement. This fifth edition merely gives the reviewer another opportunity to compliment the editor and the authorities he has selected for the different chapters. The numerous and dramatic advances that have been made in the rheumatic diseases in matters of diagnosis, pathology and therapy made this edition necessary. All of these have been amply covered by new chapters and revision of old chapters. The editor has wisely deleted obsolete material so that the book has been kept within bounds as to size and price.

If every physiatrist and Department of Physical Medicine and Rehabilitation, is to have but one book on Arthritis this is it. If one has several books on the rheumatic diseases, it is inconceivable that one could be without this new edition. Each medical specialty field is fortunate if it has at least one text which is a classic in the broadest terms; for the rheumatic field, this work is the classic.

ADVANCES IN ENZYMOLOGY. Volume XIV. Edited by *F. F. Nord*, Fordham University, New York, N. Y. Cloth. Price, $9.25. Pp. 470, with illustrations. Interscience Publishers, Inc., 250 Fifth Ave., New York 1, 1953.

This volume is for specialists in an abstruse but important field of research. The opening chapter is probably the most difficult—an exposition in German—of intracellular energy-transformations and enzyme activity, from the standpoint of thermodynamics, by Bücher (Hambure). Another chapter, on the chemistry of catalysis in organic reactions, by Langenbeck (Halle) is likewise in German, and there is one in French, on new techniques in the study of protein structure, by Desnuelle (Marseille). The remaining chapters, on pantethine and related substances, on the metabolism of phenylalanine and tyrosine, on the oxidation of proteins by tyrosinase and peroxidase, on enzymic polymerization and related processes, on suggestions for a more rational classification and nomenclature of enzymes, on adsorption studies of enzymes and other proteins, and on the isolation of enzymes, are all in English, though two of the authors are from Austria and Argentina. This geographical distribution is significant and encouraging.

From so comprehensive a book on problems so fundamental to medicine, biology, and the industries, it is hard to select topics for special comment. Physiatrists interested in the problem of mineral waters and health resorts will find significance in fresh data, on page 212, on the unexpected effects of

trace elements like chromium and cerium. Those concerned with radiation will find a wealth of new information, indexed on page 448, on melanine and pigment metabolism. There are both author and subject indexes together with a cumulative index of the first 14 volumes of the series.

CHRONIC PULMONARY EMPHYSEMA. PHYSIOPATHOLOGY AND TREATMENT. By *Maurice S. Segal*, M.D., Clinical Professor of Medicine, Tufts College Medical School; Director, Department of Inhalational Therapy, Boston City Hospital and *M. J. Dulfano*, M.D., Resident, Department of Inhalational Therapy, Boston City Hospital; Research Fellow in Medicine, Tufts College Medical School, Boston. Cloth. Price, $5.50. Pp. 180, with 31 illustrations. Grune & Stratton, Inc., 381 Fourth Avenue, New York 16, 1953.

This text is another in the series of modern medical monographs. It presents in a well arranged and clear form, the principles and methods of treatment of chronic pulmonary emphysema, as established from the results of laboratory research and practical clinical experience. The physiologic aspects are adequately discussed as they apply to treatment. Pulmonary function studies are discussed and also the details of cardio-pulmonary function testing. The text is arbitrarily divided into thirteen chapters and includes twenty-five illustrations and nine tables. This book should prove of value to all physicians.

FUNCTIONAL NEUROANATOMY. By *Wendell J. S. Krieg*, B.S. in med., Ph.D., Professor of Anatomy; Formerly Professor of Neurology and Director of the Institute of Neurology, Northwestern University Medical School. Second edition. Cloth. Price, $9.00. Pp. 659, with illustrations. The Blakiston Company, Inc., 575 Madison Avenue, New York, 1953.

It is difficult for this reviewer not to appear overenthusiastic about this excellent text. It is pleasing throughout from cover to cover because of the luxurious number of unusual three dimensional line drawings, all done by the author. The large easily read print and excellent quality of paper all contribute to its effectiveness. The essence of success in presenting neuroanatomy to students would seem to depend on adequate visual presentation of structure and function. This is achieved in this new edition. There are also enough clinical references to add to its attractiveness and value for the neurologist or physiatrist. This is certainly a book which should stand on the top shelf with other classic neurological reference texts and should be considered as possible first choice for teachers of neuroanatomy.

THE SUPRARENAL CORTEX. Edited by *J. M. Yoffey*. Proceedings of the Fifth Symposium of the Colston Research Society held in the University of Bristol, April 1-4, 1952. Cloth. Price, $6.80. Pp. 232, with illustrations. Academic Press, Inc., 125 East 23rd St., New York 10, 1953.

This text represents the proceedings of the Fifth Symposium of the Colston Research Society held at the University of Bristol, April 1-4, 1952. Some twenty and different aspects of suprarenal function and related studies are discussed by authorities in their respective fields. Some of the subjects included are: Nature of the adrenal cortical secretion; adreno-genital relationship; adrenal cortex and the mammary gland; adrenal steroids and personality disorders; surgery of the adrenal gland, and clinical responses as illustrated by the treatment of the rheumatic diseases. The text is recommended for use by all interested physicians and laboratory workers.

PHYSICAL MEDICINE ABSTRACTS

The Rehabilitation of the Hemiplegic. Herman J. Bearzy.

Ohio State M. J. 48:409 (May) 1952.

Since not all hemiplegics can be aided by rehabilitation, it is necessary first of all to exclude those cases in which the pathological processes will prohibit many of the physical activities that are required in a rehabilitation program. Careful evaluation must be made of the physical and mental status of the patient with hemiplegia. The physiatrist is consulted to determine the strength of both the affected and normal muscles; to check the range of motion of the involved joints, and to institute early procedures for the prevention or correction of contractures or deformities. The physiatrist also should perform the activities-of-daily-living test to determine the amount of functional disability present. After careful evaluation of the patient has been accomplished, the internist, neurosurgeon and physiatrist work as a team to plan for the immediate and long term care of the patient. Treatment may be considered in three phases: (1) medical care of the apoplectic stroke during the immediate onset; (2) medical management of the resultant hemiplegia, and (3) those physical activities that aim to rehabilitate the individual to a life of usefulness and self independence. Physical therapy in the first stage consists of heat and massage to alleviate pain and spasticity, and to prepare the extremities for passive stretching motions. Electrotherapy also has been of some value as an aid in muscle re-education and in helping to overcome certain fixed deformities, which most hemiplegics tend to develop. The second phase of the treatment of the apoplectic stroke consists of those activities directed towards the residual hemiplegia to improve neuromuscular coordination, muscle function and muscle strength. Bedside rehabilitation activities, after the acute phase of the illness is over, should consist of a continuation of passive exercise and pulley therapy. The third and final stage of the rehabilitation program attempts to improve functional performance by retraining the patient in ambulation, reestablishing function and coordination in the affected upper extremity, improving speech performance, and establishing a good home program for the patient when he is finally discharged from the hospital or clinic. Advanced ambulation training may be carried on in the rehabilitation department or in the patient's home. Active resistive or progressive resistive exercises are given to strengthen all affected muscle groups preparatory to full ambulation. Posture exercises are given to correct any postural defects that may be present. The patient then progresses to walking between parallel bars, and finally with crutches or canes. The affected fingers and hand of the hemiplegic are the last to recover any useful function. Since most cases fail to recover full functional use of the involved hand, it is important that one-handed skills with the unaffected hand be started early and continued until the patient has regained adequate function in the affected hand for performance of the activities essential to daily living. The rehabilitation of the spastic arm should begin with a series of exercises directed towards increasing and improving motion first in the shoulder, then in the upper arm, forearm, and hand. Re-education exercises, similar to those used in poliomyelitis, are required to retain these muscles for normal functional movements. Once the normal pattern of motion has been reestablished, muscle strengthening and coordination exercises can be prescribed.

ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION

OFFICIAL JOURNAL

AMERICAN CONGRESS OF PHYSICAL MEDICINE AND REHABILITATION

AMERICAN SOCIETY OF PHYSICAL MEDICINE AND REHABILITATION

VOLUME XXXIV — January-December, 1953, Inclusive

OFFICERS OF THE AMERICAN CONGRESS OF PHYSICAL MEDICINE AND REHABILITATION

EXECUTIVE AND EDITORIAL OFFICES
30 NORTH MICHIGAN AVENUE, CHICAGO 2

BOARD OF GOVERNORS

President—William B. Snow.....New York, N. Y.
President-Elect—William D. Paul.....Iowa City, Iowa
First Vice-President—Howard A. Rusk.....New York, N. Y.
Second Vice-President—Gordon M. Martin.....Rochester, Minn.
Third Vice-President—A. B. C. Knudson.....Washington, D.C.
Fourth Vice-President—Donald L. Rose.....Kansas City, Kan.
Fifth Vice-President—Arthur C. Jones.....Portland, Ore.
Secretary—Frances Baker.....San Mateo, Calif.
Treasurer—Frank H. Krusen.....Rochester, Minn.
Executive Director—Walter J. Zeiter.....Cleveland, Ohio
Executive Secretary—Dorothea C. Augustin.....Chicago, Ill.

EXECUTIVE COUNCIL

Walter M. Solomon, M.D., Cleveland, O., Chairman.
Norman E. Titus, M.D., West Chester, Pa., Secretary.
Robert L. Bennett, M.D., Warm Springs, Ga.
William Bierman, M.D., New York, N.Y.
Earl C. Elkins, M.D., Rochester, Minn.
Kristian G. Hansson, M.D., New York, N.Y.
John Severy Hibben, M.D., Pasadena, Calif.
Abraham R. Hollender, M.D., Miami Beach, Fla.
O. L. Huddleston, M.D., Santa Monica, Calif.
H. Worley Kendell, M.D., Peoria, Ill.
Miland E. Knapp, M.D., Minneapolis.
Disraeli Kobak, M.D., Chicago.
Frank H. Krusen, M.D., Rochester, Minn.
Walter S. McClellan, M.D., Saratoga Springs, N.Y.
Fred B. Moor, M.D., Los Angeles.
Nathan H. Polmer, M.D., New Orleans, La.
William H. Schmidt, M.D., Philadelphia.
Arthur L. Watkins, M.D., Boston, Mass.
William B. Snow, M.D., New York, Ex-Officio.

EDITOR EMERITUS

Disraeli Kobak .....Chicago, Ill.

SUBJECT INDEX

This is an index of all the reading matter in the *ARCHIVES*, except the Medical News Department.

The letters used to explain in which department the matter indexed appears are as follows: "E," Editorial; "ab," abstracts; the asterisk (*) indicates an original article in the *ARCHIVES*.

This is a subject index and one should, therefore, look for the subject word, with the following exceptions: "Book Reviews" and "Deaths," are indexed under these titles at the end of the letters "B" and "D." The name of the author, in brackets, follows the subject entry. If there are more than two authors, only the name of the first author is given.

For author index, see page 776.

BOOK REVIEWS

C

D

DEATHS

E

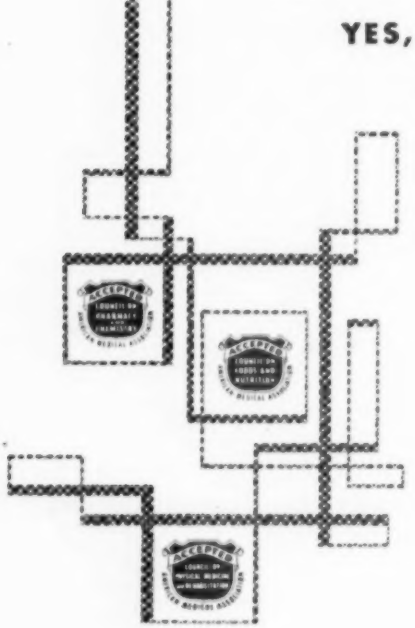
AUTHOR INDEX

In this Index are the names of the authors which have appeared in the *Archives*. The asterisk (*) preceding the page reference indicates that the article appeared in full in the *Archives;* "d" refers to discussion; "E" refers to editorial and "ab" indicates abstract. For subject index, see page 770.

INDEX TO PAGES

Of the Archives, According to Monthly Issues — Volume XXXIV, January-December, 1953

It is PRICELESS yet, FREE



YES, the A. M. A. Council Seal is awarded without payment of any fee or obligation to advertise.

The manufacturers submit their products on a purely voluntary basis. The evidence is reviewed—the claims are checked—the chemical laboratory makes the necessary tests and the results are examined by a critical group of physicians in various fields of medicine.

If the product is found satisfactory and necessary conditions are met, it is awarded Council Acceptance. This intensive examination by the Council is made without fee from the manufacturer—there is no payment of any sort made. The Council's actions are based on purely the available evidence—not any financial consideration.

If anyone tells you "they cannot afford Council Acceptance for their product," you can discount it 100%—the chances are that members of his firm are not familiar with Council Rules or Standards, or did not realize that the product could be acceptable to the Council.

This is one of a series of advertisements designed to explain the Councils' functions to you.

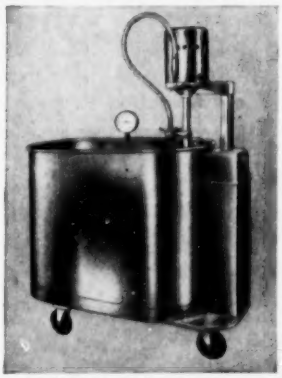
WHITEHALL *Whirlpool Baths*

for gentle, safe, effective combined massage and heat therapy.

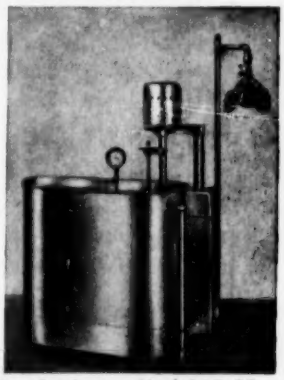
The best method of heat application on extremities for hospital and office use.
"It is our clinical experience with over 3000 cases that this mode of treatment (whirlpool bath) gives the best therapeutic response."*

APPLICATIONS

- To induce hyperemia for increased cellular response.
- To relieve vascular and muscular spasm.
- To remove obstruction and promote drainage.
- To allay pain by sedating irritative conditions of nerves.
- To restore the function of underpar organs or parts of the body.



Mobile Model JO-10
Arm, leg, hip and lumbar region



Stationary Model JO-20
Arm, leg, hip and lumbar region

The WHITEHALL ONE MOTOR mobile whirlpool bath unit is the first mobile unit in which the 2 operations of agitation and emptying are combined into one** —as compared with the cumbersome construction and operation of the ordinary "2 motor" mobile unit.**

Model JO-400
WHITEHALL Hydromassage Whirlpool Bath for Full Body Immersion

THE ADVANTAGES OF THE WHITEHALL ONE MOTOR mobile unit are:

- **SIMPLIFIED CONSTRUCTION through elimination of troublesome "2 motor" parts.**
- **FASTER EMPTYING**
- **LOWER PRICES**

Other features of WHITEHALL WHIRLPOOL BATHS are: High Pressure Jet, Double Action Pressure Control Valve, Auto-Counter-Balancer

*Currence, J. D., N. Y. State J. of Med. 48:2044, 1948
**U. S. Patent No. 2555686

WHITEHALL ELECTRO MEDICAL COMPANY, INC.
19 Wall St. Passaic, N. J.

Please send me catalogue with detailed description of full line of WHITEHALL Whirlpool Units, reprints and additional information.

Name .....

Street .....

City ..... Zone ..... State .....

A

American Congress of Physical Medicine and Rehabilitation

30 North Michigan Avenue
Chicago 2, Illinois

APPLICATION FOR MEMBERSHIP

Date.....

Name of Applicant.....
Please Print (Last Name) (First Name) (Middle Name)

Present Address.....
(Street)

.....
(City) (Zone) (State) (County)

1. Age.....Date of Birth.....Place of Birth.....
2. Medical School and Year Graduated.....
3. Licensed in State of.....In Year of.....
4. I am a member in good standing of the.....
   County Medical Society, State of.....
   THE NAME AND ADDRESS OF THE SECRETARY.....
   OF THE COUNTY MEDICAL SOCIETY IS.....
5. Active member of the following Medical Societies.....
   (Including other Special Societies)

.....

.....

6. Teaching affiliations .....

.....

.....

7. Hospital affiliations (Staff position).....

.....

.....

8. Specialty .....
9. Sponsored by .....

I hereby make application for membership in your society, and if accepted, I agree to support the Constitution and By-Laws and to practice in accordance with the established usages of the Medical Profession.

.....
Signature of Applicant (in ink)

Annual dues of $20.00, include a subscription to official Journal ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION. Check must acocmpany application.

I wish my copy of the ARCHIVES to be addressed and mailed as follows:

.....
Please print. (Name)

.....
(Street)

.....
(City) (Zone) (State)

Announcing . . .

The Annual Essay Award

sponsored by the

AMERICAN CONGRESS OF PHYSICAL MEDICINE AND REHABILITATION

To stimulate interest in the field of physical medicine and rehabilitation, the American Congress of Physical Medicine and Rehabilitation will award annually, a prize for an essay on any subject relating to physical medicine and rehabilitation. The contest, while open to anyone, is primarily directed to medical students, internes, residents, graduate students in the pre-clinical sciences and graduate students in physical medicine and rehabilitation. The Annual Awards Committee suggests that members of the American Congress and American Society of Physical Medicine and Rehabilitation bring this announcement to the attention of interested persons. The following rules and regulations apply to the contest:

1. Any subject of interest or pertaining to the field of physical medicine and rehabilitation may be submitted.

2. Manuscripts **must be** in the office of the American Congress of Physical Medicine and Rehabilitation, 30 N. Michigan Ave., Chicago 2, not later than June 1, 1954.

3. Contributions will be accepted from medical students, internes, residents, graduate students in the pre-clinical sciences, and graduate students in physical medicine and rehabilitation.

4. The essay must not have been published previously.

5. The American Congress of Physical Medicine and Rehabilitation shall have the exclusive right to publish the winning essay in its official journal, the ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION.

6. Manuscripts must not exceed 5000 words (exclusive of headings, references, legends for cuts, tables, etc.), and the number of words should be stated on the title page. An original and one carbon copy of the manuscript must be submitted.

7. The winner shall receive a cash award of $200, a gold medal properly engraved, a certificate of award and an invitation to present the contribution at the 32nd Annual Session of the American Congress of Physical Medicine and Rehabilitation at the Hotel Statler, Washington, D. C., September 6-11, 1954.

8. The winner shall be determined by the Annual Awards Committee composed of four members of the American Congress of Physical Medicine and Rehabilitation.

9. All manuscripts will be returned as soon as possible after the name of the winner is announced.

10. The American Congress of Physical Medicine and Rehabilitation reserves the right to make no award if, in the judgment of the Annual Awards Committee, no contribution is acceptable. The Congress may also award certificates of merit to contributors whose essays may be considered second and third best submitted. Announcement of the winner will be made after the annual meeting. Officers and members of the American Congress and the American Society of Physical Medicine and Rehabilitation are not eligible for this award.

$V = f\lambda$

$\lambda = \frac{V}{f}$

$f = \frac{V}{\lambda}$

V = velocity
f = frequency
λ = wavelength

...And now

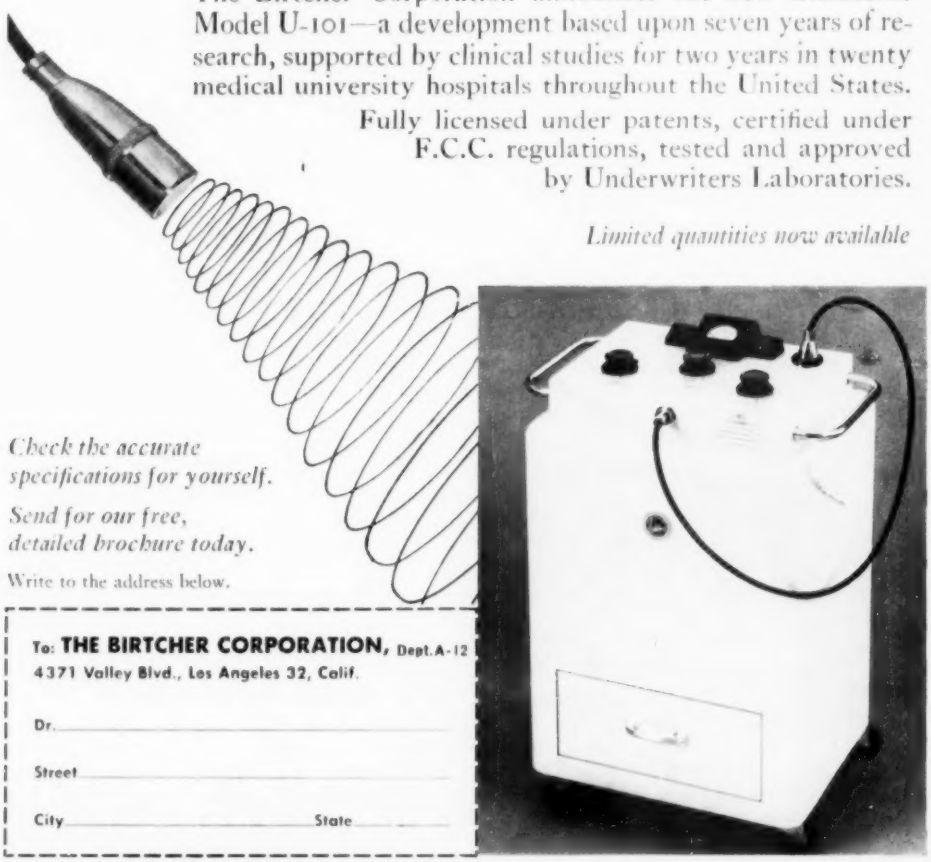
THE BIRTCHER ULTRASONIC UNIT

available to the Medical Profession

The Birtcher Corporation announces the new Ultrasonic Model U-101—a development based upon seven years of research, supported by clinical studies for two years in twenty medical university hospitals throughout the United States.

Fully licensed under patents, certified under F.C.C. regulations, tested and approved by Underwriters Laboratories.

Limited quantities now available



Check the accurate specifications for yourself.

Send for our free, detailed brochure today.

Write to the address below.

To: **THE BIRTCHER CORPORATION,** Dept. A-12
4371 Valley Blvd., Los Angeles 32, Calif.

Dr. _____

Street _____

City _____ State _____